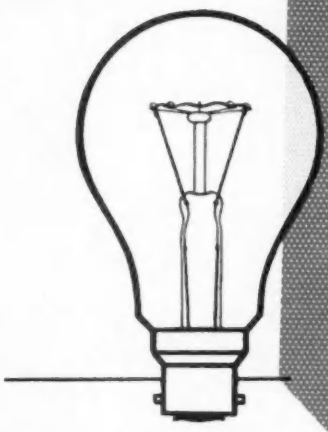
ELECTRICAL TIMES

THURSDAY
16 JULY
1953
NINEPENCE

The power in a Mazda lamp...

is utilised to give the greatest possible value to the user in terms of light and life.



The power behind a Mazda lamp...

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4418

Mazda *lamps stay brighter longer*

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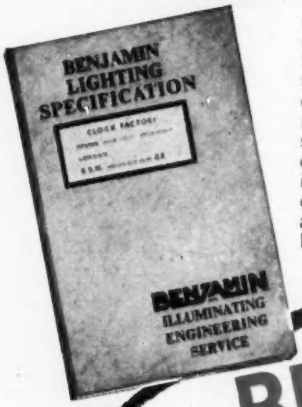

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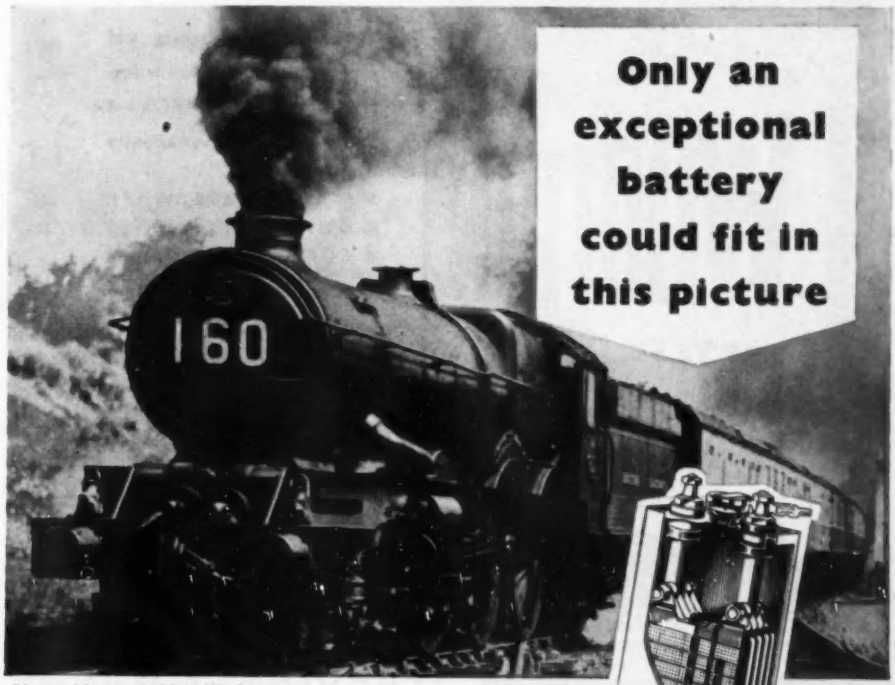

Only an exceptional battery could fit in this picture

Photograph by courtesy of British Railways

When an express train is thundering down the rails, on schedule to the minute, every part of the locomotive is being put to a gruelling test. The batteries which travel on these giants—no less than any other part of the engine — have to be good to take the hours-long pounding every trip entails.

Eighteen years ago, the G.W.R. chose Nife steel batteries to ride on their locomotives, acting as watchdogs of safe rail travel, and British Railways' Western Region have seen no reason to change. Little wonder, since some of the original batteries are still in use after giving 17 and 18 years of trouble-free service! Today 4,500 Nife batteries provide the operative power for the Region's automatic train control system.

Nife Batteries can take it

Except when the brakes are on, Nife batteries are under a small but continuous load and subjected to constant vibration and shock. Nife batteries stand up to rough usage because they're made of steel — case and plates—and have great mechanical strength. They cost little to maintain and give maximum energy in a minimum space.

Exceptional ruggedness and dependability make Nife batteries in demand for all railway needs; signal controls and point machines, communications, lighting and control circuits on electric trains, electric locomotive control batteries, sub-station switchgear control and protection, and platform trucks. In fact, you'll find Nife Batteries doing the toughest jobs, the world over.

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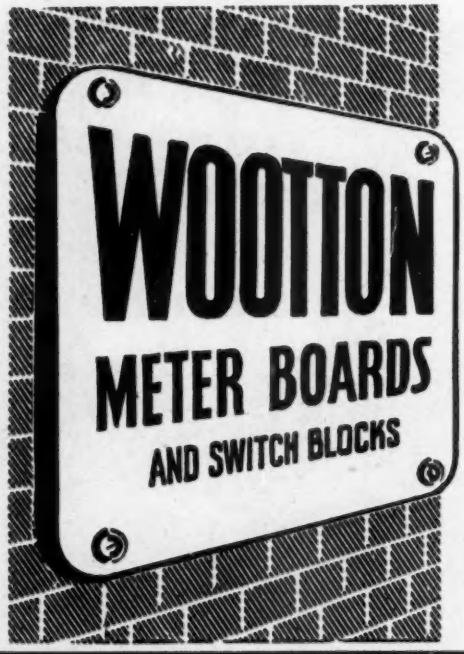

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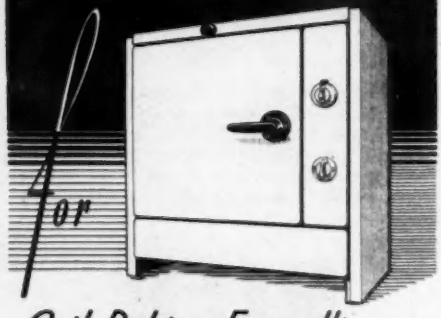

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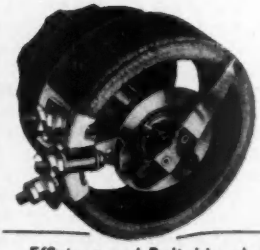

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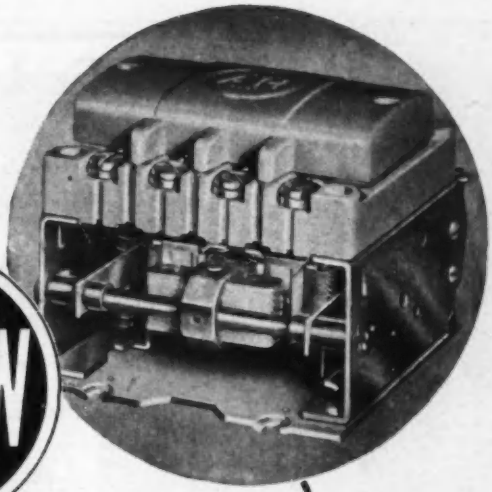

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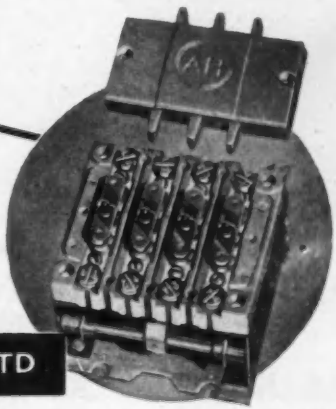

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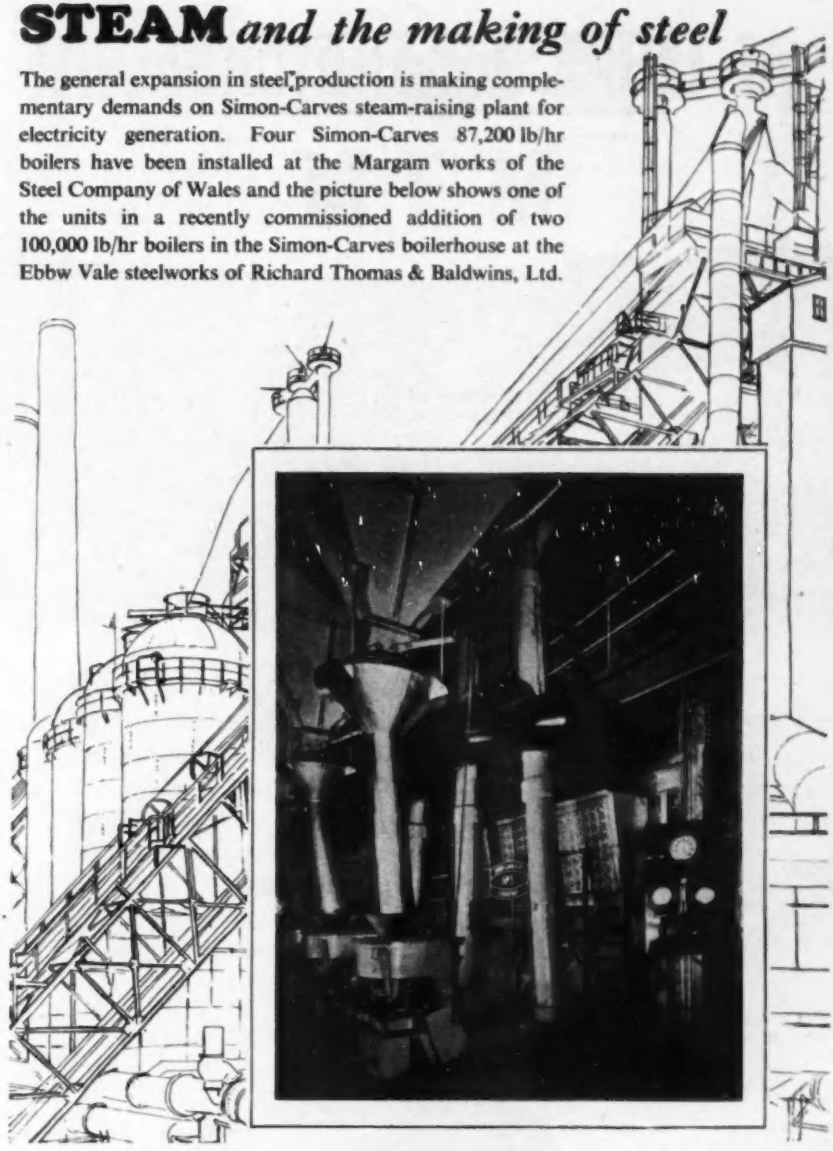
The general expansion in steel production is making complementary demands on Simon-Carves steam-raising plant for electricity generation. Four Simon-Carves 87,200 lb/hr boilers have been installed at the Margam works of the Steel Company of Wales and the picture below shows one of the units in a recently commissioned addition of two 100,000 lb/hr boilers in the Simon-Carves boilerhouse at the Ebbw Vale steelworks of Richard Thomas & Baldwins, Ltd.



Steam power by Simon-Carves Ltd

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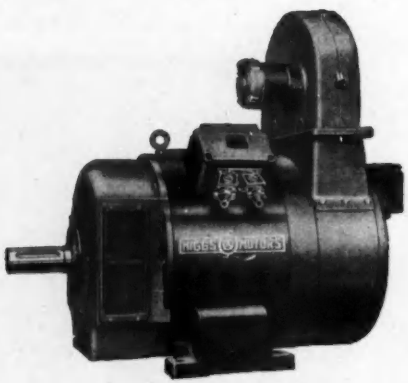

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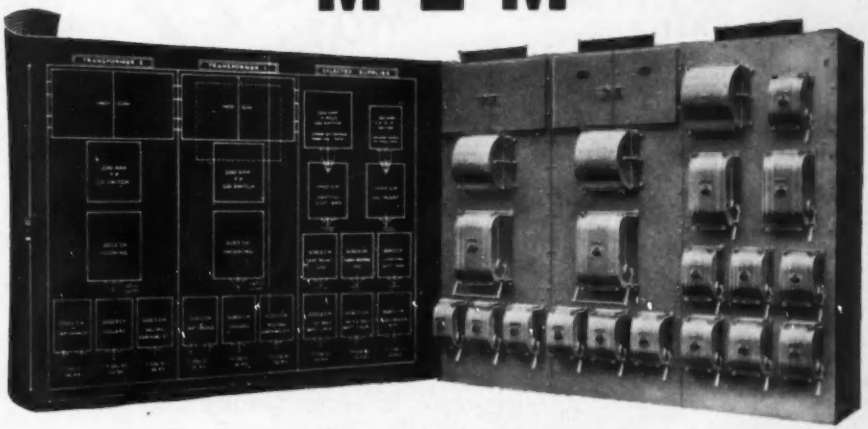

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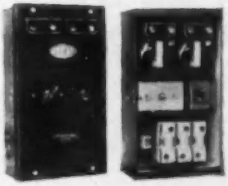

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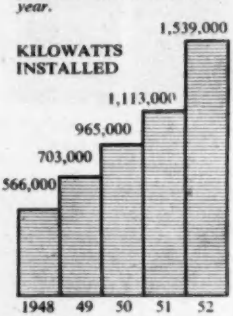
PRESENT

Today there is plenty of electricity for all consumers, industrial, commercial and domestic. The power stations are producing only about half their full potential output during the working week; at weekends there is a still larger surplus capacity.

Five years' Progress

In the five years since the British Electricity Authority came into being, record amounts of new generating plant have been installed each year.

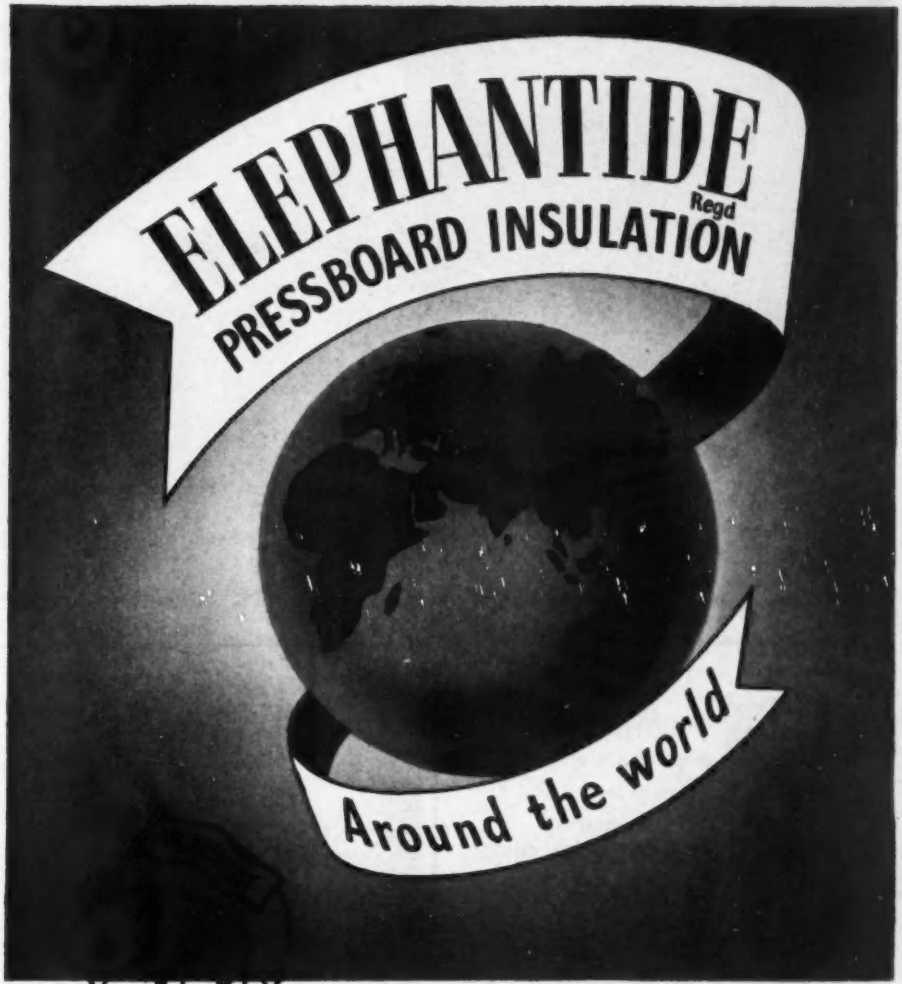


In 1952 there was installed more than twice the pre-war record figure of 759,000 kilowatts.

FUTURE

This vast potential electricity supply — approximately equal to the 57,000,000,000 units sent out from the power stations last year — is on tap at the touch of a switch.

BRITISH ELECTRICITY



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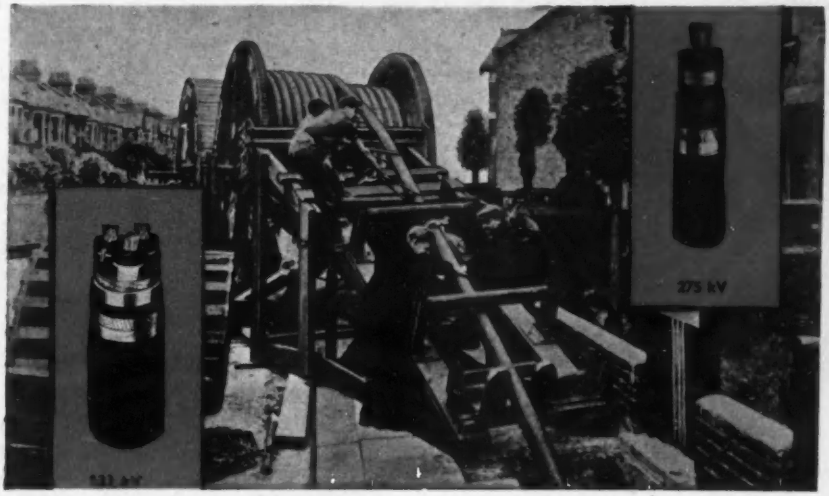

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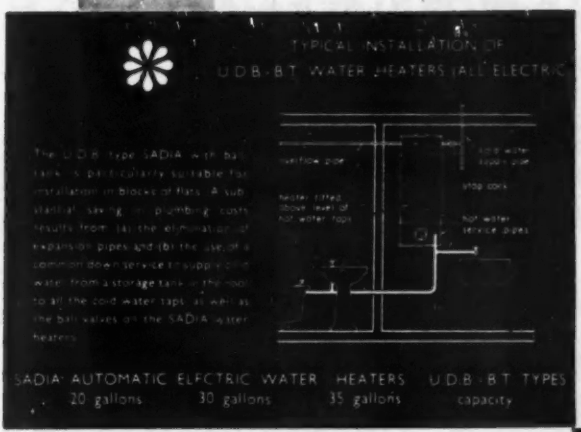

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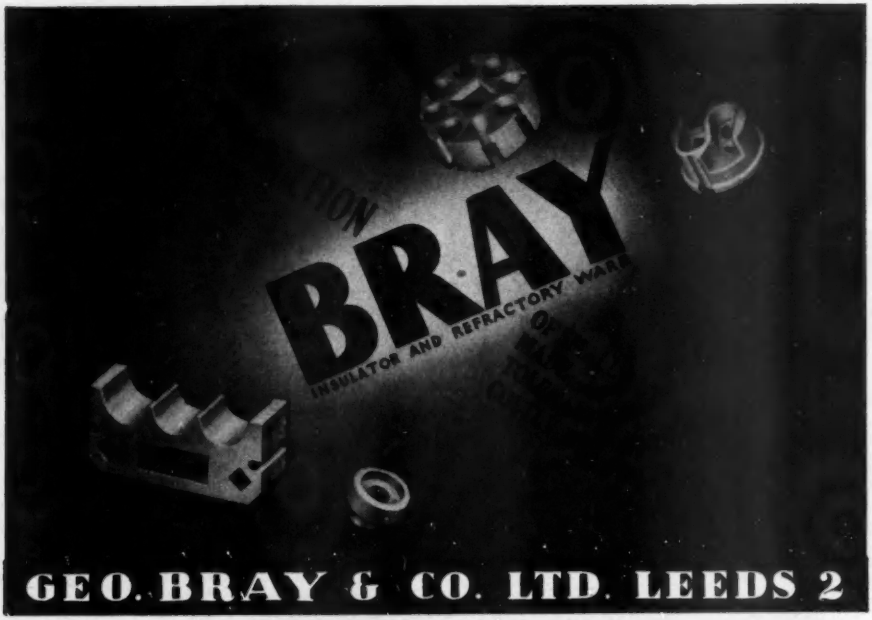

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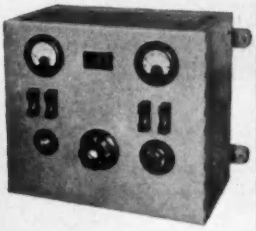

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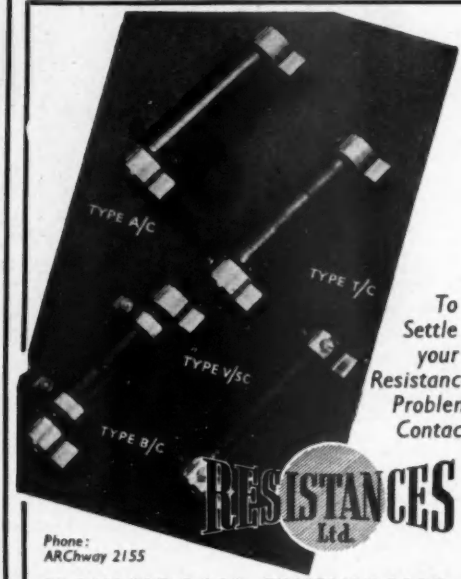

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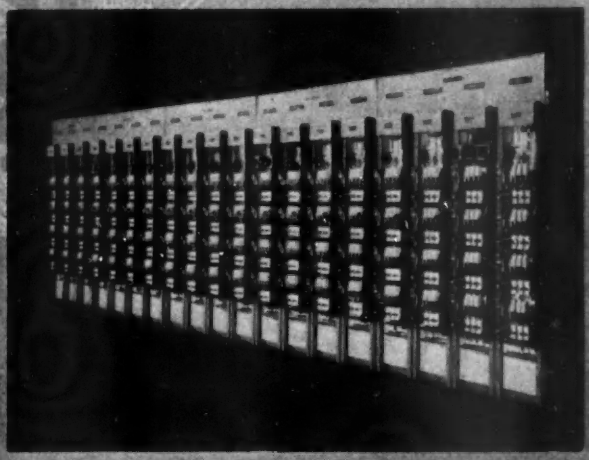
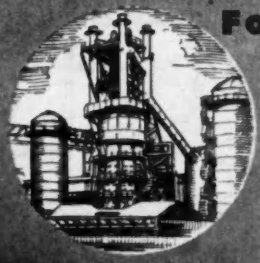
WOLVERHAMPTON ENGLAND

Contactor Control Gear





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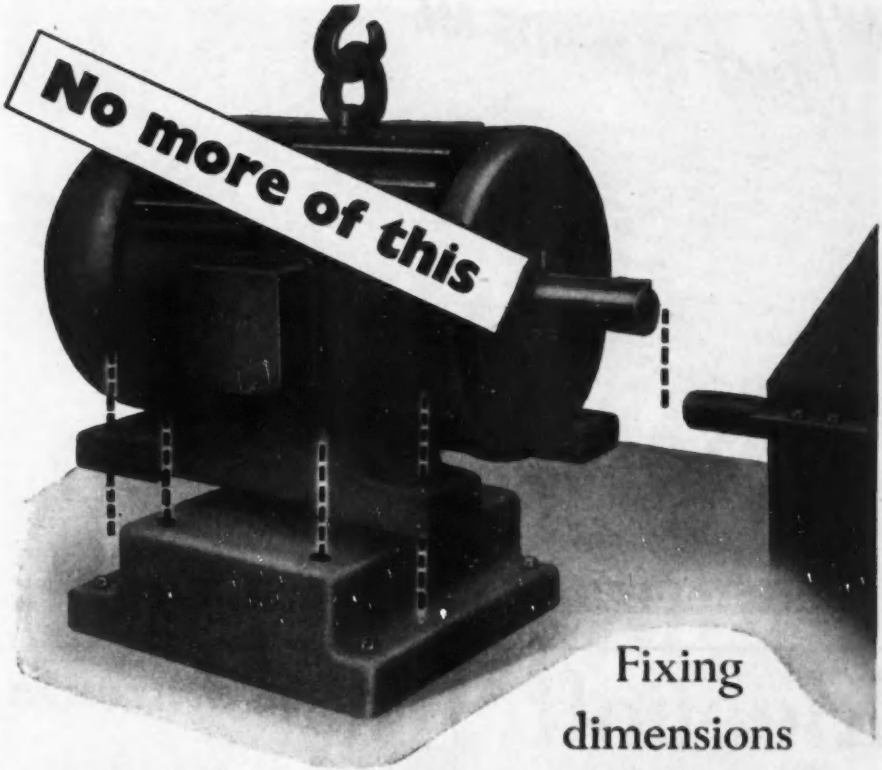

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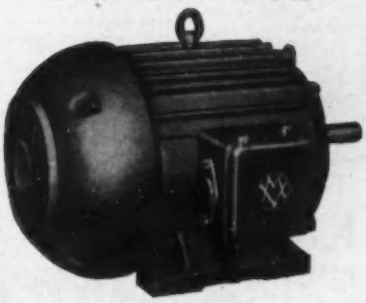

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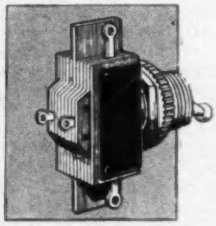

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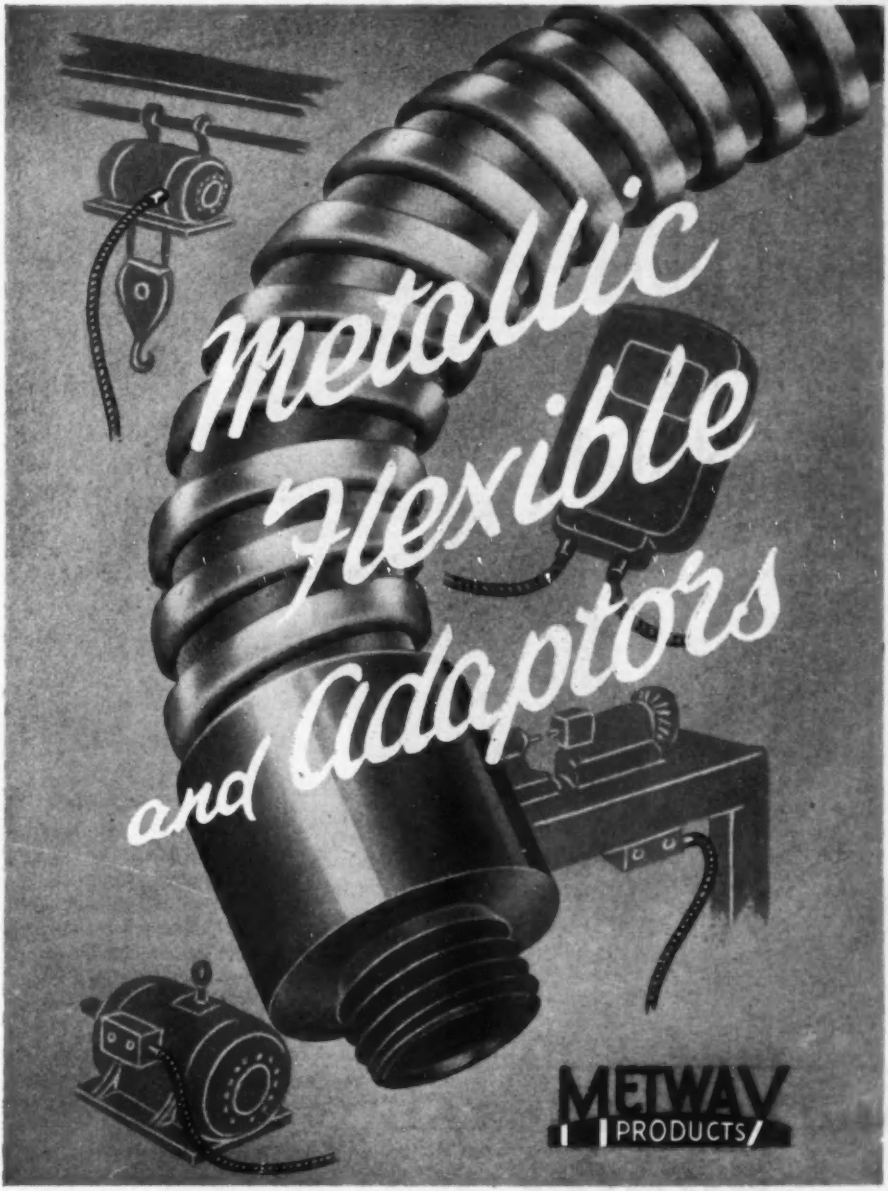

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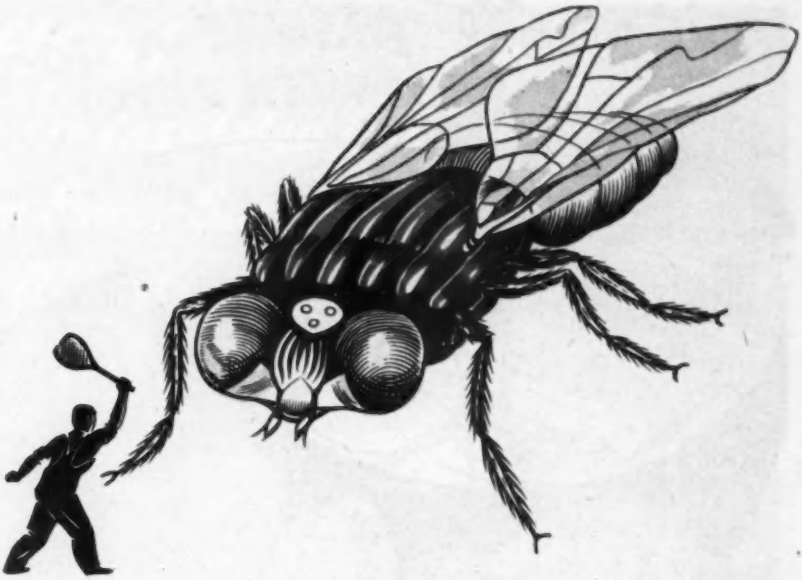

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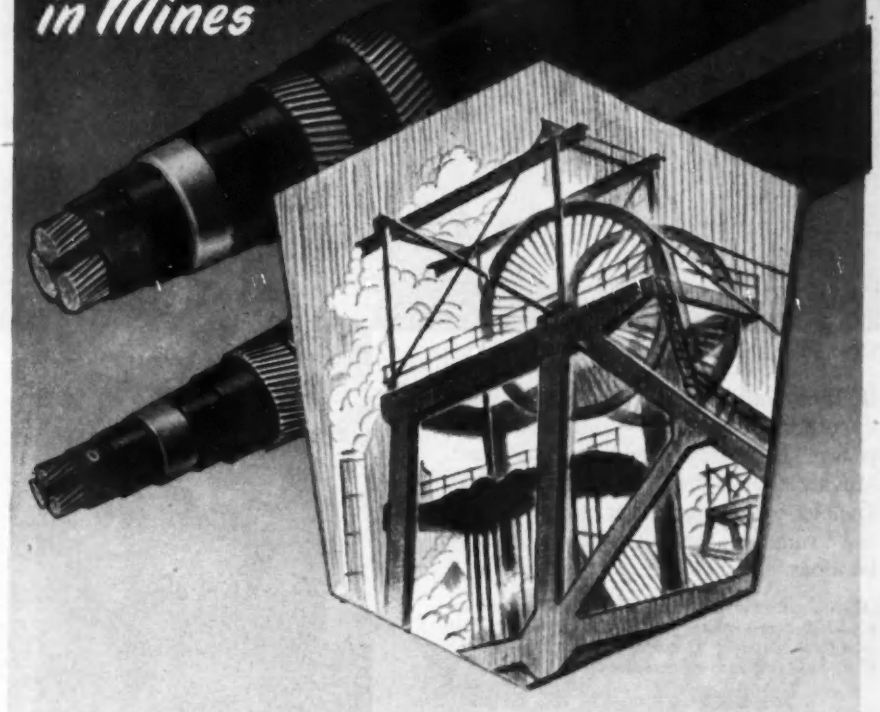

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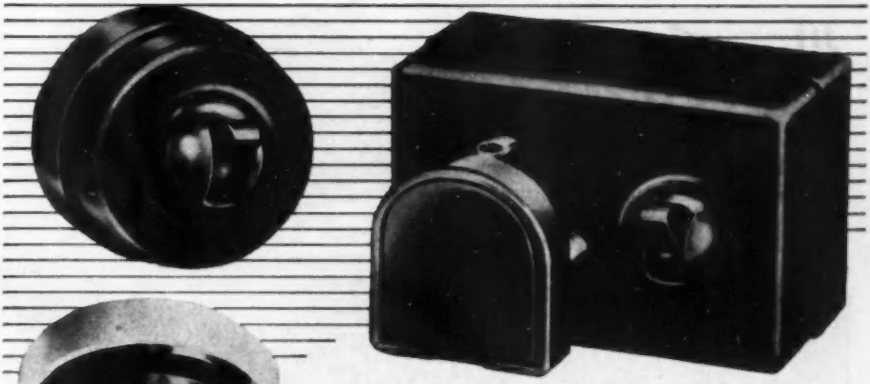

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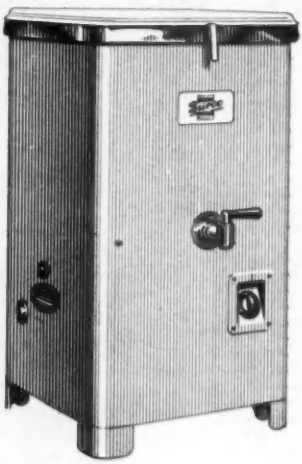

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200	TF200	251	933	2033
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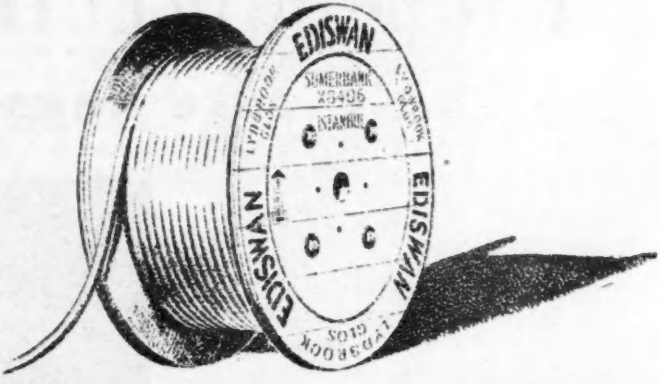

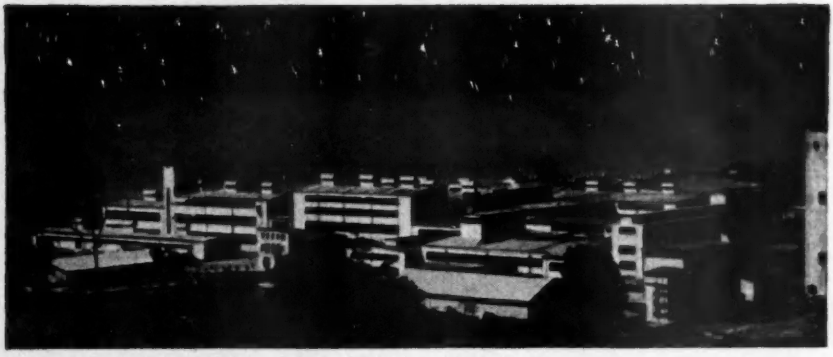

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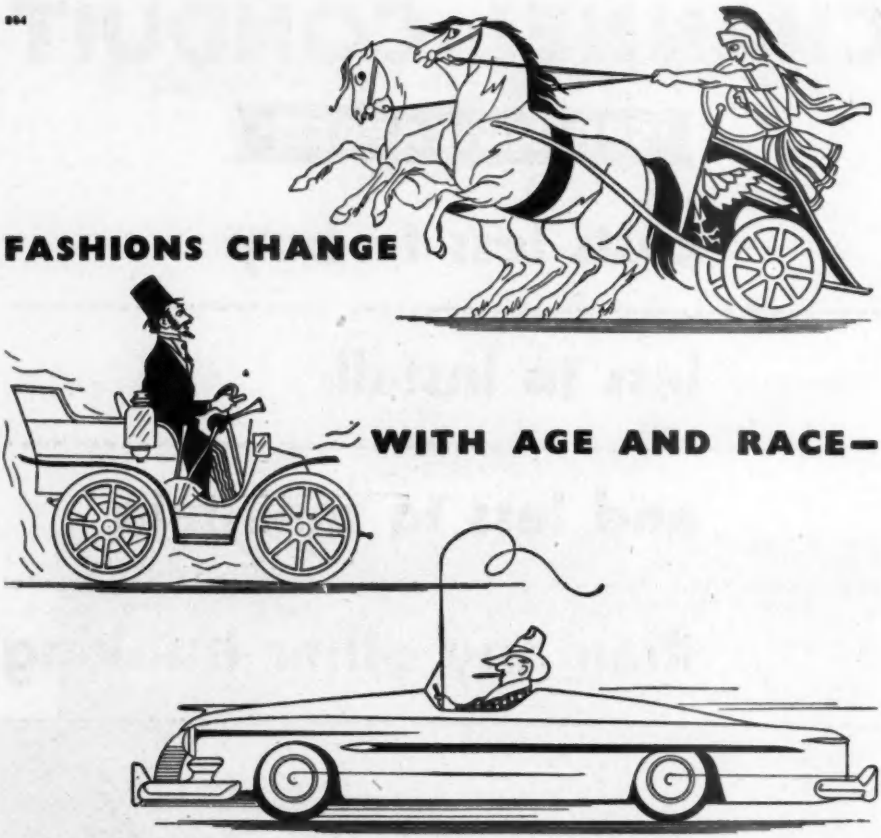

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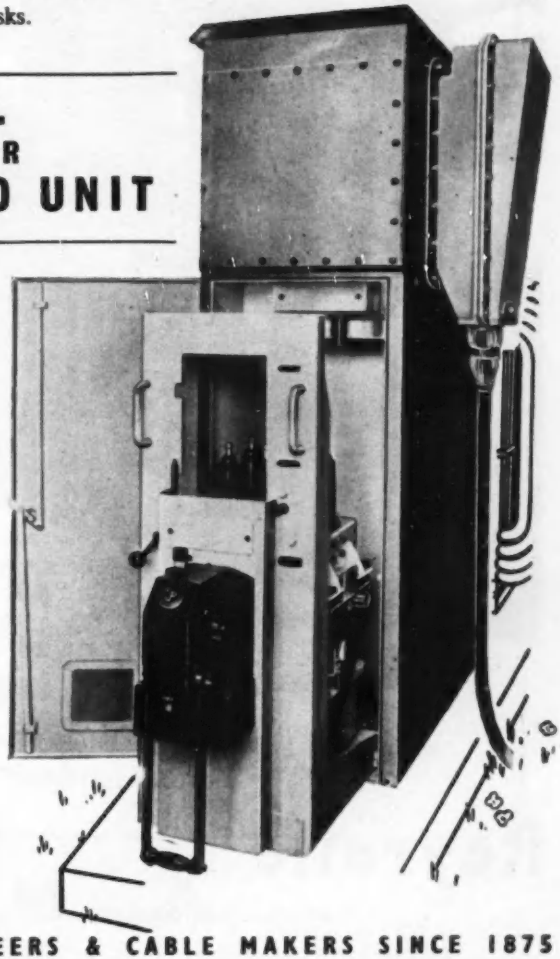

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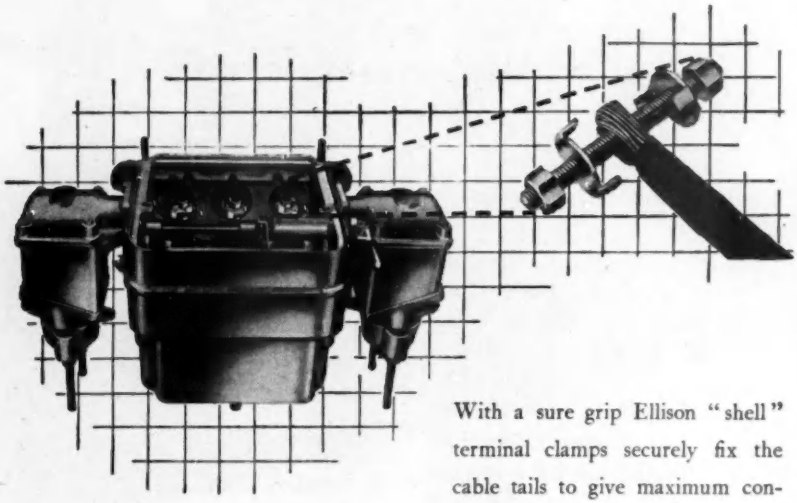

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Volume 124 No. 3219 16 JULY, 1953

PUBLISHED EVERY THURSDAY

SUPPLIES FOR THE OUTBACK 97
ELECTRIC RAILWAYS IN THE HIGHLANDS 102
SELF-EXCITATION OF CAPACITOR-COMPENSATED INDUCTION MOTORS, by J. A. Nicholson, M.Sc. ... 103
ST. LAWRENCE—A FURTHER STAGE 104
FROM AN ENGINEER'S NOTEBOOK 105
4,500 lb.—1,050° F. REHEAT 106
PROBLEMS AND PRACTICE IN ENGINEERING... ... 109
PREVENTING POLLUTION OF THE ATMOSPHERE ... 111
INDUSTRIAL USES OF TELEVISION 114
CHECKING FOR MOISTURE IN INSULATION 115
HIGH-SPEED RAIL-CARS IN LEEDS 117
OVERSEAS NEWS 118
PERSONALITIES IN THE INDUSTRY 120
I.E.E. COUNCIL AND CHAIRMEN 121
NEW LITERATURE... 122
CASE-HARDENING BAR STOCK 123
BRITISH STANDARDS 124
A NEW RANGE OF REVO FIRES... 124
THE BUYER'S COLUMN 125
ALUMINIUM MASTS 127
THE WEEK IN NEWS 128
Questions in Parliament... 132
Electric Supply News 134
Company Activities 135
COMMERCIAL INFORMATION 136
CLASSIFIED ADVERTISEMENTS 43
INDEX TO ADVERTISERS... 50

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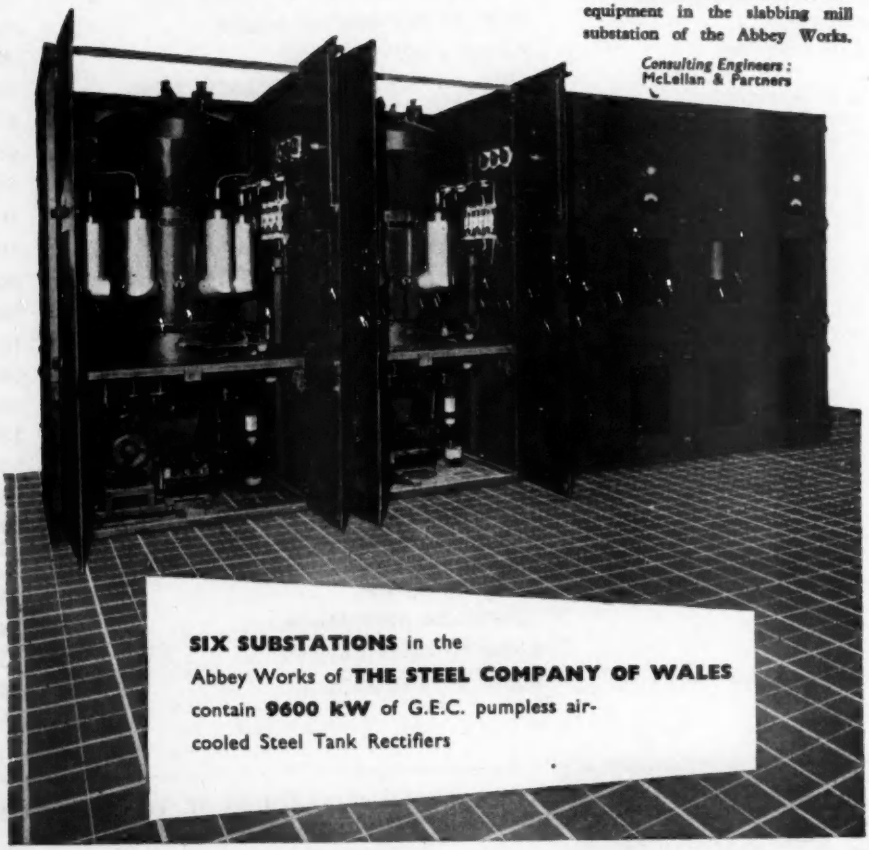

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Editorial

WHENCE THE TECHNOLOGISTS

THE need for greater investment in industry and the lack of trained scientists and technologists are two themes which are constantly reiterated from the platform and in the Press. It is unfortunate that the sixth report of the Advisory Council on Scientific Policy, published last week, has little to say on the subject of science in industry, other than to repeat these well-known facts. Of remedies there is little to offer; greater use of technically trained men on boards of management and the extension of activities of research associations seem the most optimistic that the Council can bring forward. On the supply of technically trained men, the University Grants Committee had expressed themselves only a few days earlier, in a preview of their past five years' work. They view with some alarm the present high output of arts graduates, at the same time expressing the familiar need for technical graduates. Pure science apparently attracts more applicants than there are places, but the reverse appears to be the case with technological courses. The remedy for the former is clear, but not so in the case of the latter. If applicants for technical training are not coming forward in sufficient numbers, how can they be increased? We would suggest that the answer be found in improving the lot of the technologist, not only in remuneration, but in opportunities for higher promotion, and in all those other factors which are summated in that one word—status. It may not be possible to warp individual bent from the sphere of the arts to technology, but there must be marginal cases which will be subject to the economic law of supply and demand, if that demand be expressed in concrete realities by the industry that needs the technologists, and by greater social recognition of the engineer.

UPRATING PLANT VALUE

SHOULD electricity consumers be required to contribute to the formation of capital for new plant? That is a question that is likely to come up for international discussion under a consideration of depreciational policy. Electricity supply in all countries has an insatiable appetite for capital, at the same time, due to the fall in money values, most existing plant stands on the books at too low a value. If depreciation were charged on such plant at a rate commensurate with its present-day value instead of its historical cost, a source of additional capital would be obtained thereby. Unfortunately, such a sum would be shown in the accounts as a profit and, as such, in most countries, would suffer from severe taxation. In discussing this matter, it is hoped that by comparing of notes, some easement of the position may eventually arise. The problem, however, is one common to nearly all industries, but it gives rise to special concern with electricity supply due to the high capital intake. On the other hand, old plant usually operates at a lower efficiency than new, and any writing-up of book values would therefore introduce the clumsy technique of adjustment for improved running costs. In the case of the B.E.A., a most modest depreciational rate on book values is employed, a rate which we have always felt could be steepened with advantage. With such a policy it is hardly likely they will favour the other extreme which, by uprating historical costs, in effect, taxes consumers to cover part of the capital needs.

THE OPERATIONAL MANAGER

TO those actively interested in problems in management arising out of nationalisation we have often commended the studies made by the Acton Society Trust. A work more ambitious than the previous pamph-

lets, entitled "Management under Nationalisation," has now been published, in which the field work reported consists of case studies, one from each of the major industries. The selection of a power station superintendent as a case representative of the supply industry is questionable, bearing in mind the differing structure on the distribution side. However, few will dispute the authors' major findings even though some may consider them oversimplified. The two major criticisms which emerge are the lack of direct contact with top management and the impact of specialists from higher levels of authority. The authors of this study come down strongly in favour of greater freedom for the operational manager. He should have sufficient authority to feel responsible for the operational efficiency of his unit, and to this end he should have power to engage senior staff, with freedom to call in specialists even from outside the organisation if considered desirable. Satisfactory tests for efficiency should be provided, by which the manager can assess for himself the results of his unit. On that difficult problem, the removal of an inefficient manager, the authors are less precise, but none the less it is a problem that must be faced if the industry is to remain efficient. There is, perhaps, little in this book that will be new to those concerned with management problems, but the manner of presentation provides a clarity of view which is not always available.

INVITATION TO TENDER

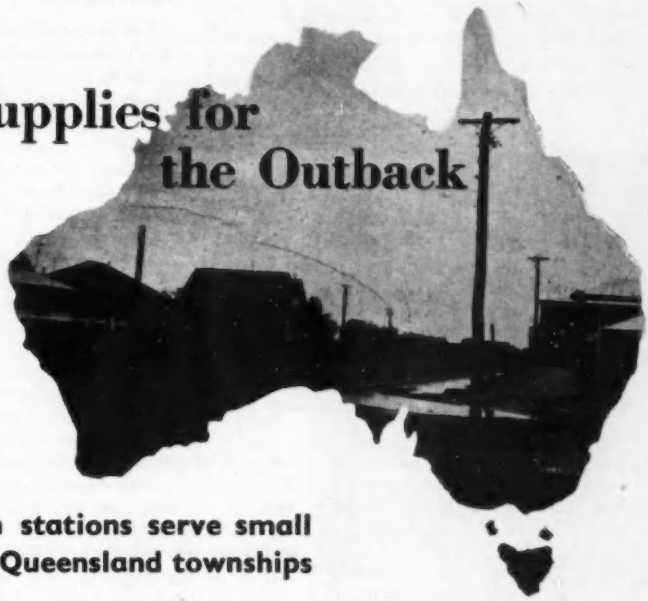
THE storm that has blown up in Belfast is one more unfortunate episode in this undertaking's history. As reported last week, the trouble arose due to the submission of a tender by an uninvited firm after the closing date and after the firm selected from those submitting tenders had been instructed to put the work in hand. As the new bid was £226,496 below the published accepted figure, the stage was set for trouble. Unfortunately, but inevitably, the occasion provided a suitable opportunity for the making of political capital and the situation has now deteriorated to one which cannot be resolved without serious heartburnings on one side or the other. Either the electricity committee must suffer the feeling of apparently paying too much for plant, or injustice must be done to the original tenderers by calling for new bids, a practice reminiscent of the much condemned Chief Joseph dam contract. The basic cause of the whole unpleasant situation was the invitation of selected firms to tender, a practice which has increased considerably in the past few years and one, we would add, that has not been discouraged by the similarities which exist in some cases of the prices tendered. Unquestionably there are advantages to be had by inviting selected firms to tender, but the only satisfactory way of avoiding such fracas as that in Belfast is to call for advertisement, for it is not enough that the price be a fair one, it must be patent to all that it is fair.

THE START OF THE BACKBONE

THE grid network, contrary to many other h.v. transmission schemes, was never designed for bulk power transmission and with the greater requirements for power today, the need for a "backbone" system of yet higher voltage has been the acknowledged policy of the B.E.A. It is well known that existing transmission capacity has been sorely tried in the last few years, so a special welcome will be given to the inauguration of the first section of the 275 kV system by Sir John Hacking this week. Doubly so, since practical experience on higher voltage equipment has not been available in this country to our manufacturers making plant of this category for export. Furthermore, development work is now being carried out on the next step to 380/400 kV for eventual transmission from the coalfields of the Midlands to the Southern areas. As the new superimposed grid comes into service, section by section, it should greatly ease the problems of power flow with which our control engineers are beset, and reinforce confidence both at home and overseas in this country's ability to maintain its position in high-voltage technique.

Meteor

Supplies for the Outback



One-man stations serve small Western Queensland townships

WESTERN QUEENSLAND has many small townships with populations between 250 and 1,000, which are centres for the widespread stations of a cattle-raising country. There is a great opportunity for electricity to add to the amenities of such towns, yet in general they are too far apart to provide the mutual support that might justify a large generating station.

The State Electricity Commission of Queensland has, much to its credit, not allowed this difficulty to defeat it. From prolonged study of the problem it has isolated two main difficulties, and has evolved means of overcoming each in turn. High capital cost, common to all rural schemes, but especially difficult here, has been answered with a Government subsidy scheme, which covers up to 65% of the first cost of an electrification project. More peculiar to Australia is the problem of high labour costs. To meet this, recourse has been had to full use of automatic equipment. Plant of limited capacity is provided with ample safety devices, and is staffed at a level of one man per township. Furthermore, close attention to standardisation has ensured that plants are easy to operate and maintain, quite apart from its added value in keeping establishment costs to a minimum.

In the heading illustration is depicted a view of one of the small townships whose electrical supplies are described in this article

Each scheme has been constructed by the State Electricity Commission for the local authority concerned, and then handed over for operation—though assistance from the Commission remains available, and general supervision is still exercised by that body.

Power stations are pre-fabricated buildings (Fig. 1) and at their heart are three-phase 415 V 16 kW alternators, driven by 31 b.h.p. crude oil engines running at the low speed of 400 r.p.m. The prime movers are horizontal single-cylinder machines, driving the associated generators through five vee-belts.

For starting the oil engines, petrol-engine-driven air compressors are provided. Cooling water is obtained in a closed-circuit system from corrugated iron tanks mounted outside the engine-house. There are three tanks for each engine, holding a total of 900 gallons of water. (Fig. 8.) Naturally, with slow-running single-cylinder engines special attention has to be paid to smoothing-out cyclic irregularities. The vee-belt drive gives some help in this respect, but in the main reliance is placed upon large flywheels to provide smoothing-out (Fig. 5).

Favourable capital cost was an important

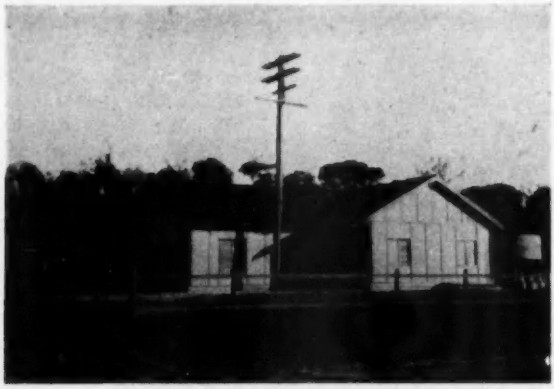


Fig. 1. A view of a typical Western Queensland power station showing the type of prefabricated building used

factor in the decision to use engines of this slow-running design, as was also the low running cost that follows from the use of the cheaper grades of diesel oil. Importance was also attached to the ready accessibility of all parts of the machine, for maintenance, like operation, has to be conducted by a single engineer. Sturdy construction, possible with low speed running, and a small number of moving parts are other important characteristics which promise long life and minimum maintenance.

Engine Protection

Several protective devices are incorporated in the oil engine, all of them operating by shutting off the fuel supply. Contacts of various detecting devices are placed in series with a 32 V hold-on solenoid which operates on the main fuel valve (Fig. 2). This control circuit is supplied by a step-down transformer whose primary is connected across the phase-neutral terminals of the associated alternator. Protection is thus provided against excessive engine speed variations, low level of lubricating oil in the appropriate reservoir, excessive bearing and cooling water temperatures.

Engine speed is detected with the aid of a tachometer-generator driven through bevel gearing: $\pm$ 6% is the normally permitted variation. For bearing temperatures, thermistor pellets are fitted, wired in series and provided with a l.v. d.c. supply. When temperature rises, the resistance of the thermistor falls, and a relay associated with the circuit then operates. This has two sets of contacts. One (normally closed) opens to break the fuel solenoid circuit, and the other (normally open) closes and causes an indicator lamp to light.

Alternators

Compensated self-excited alternators were selected as the most suitable for running in parallel. Those used are manufactured by Mawdsley's, Ltd. The inherent regulation of these machines is within $\pm$ 3% at any load and power factor, and no external voltage regulator is required. The rated capacity of each alternator is 16 kW, with a full load current of 26 amps/phase. It is stated that a 20% overload on the alternator can be carried continuously by the engine at full load, without any apparent temperature rise.

This type of alternator has a stationary field system and a rotating armature, two armature cores being mounted on the same shaft. Main and auxiliary cores have the same number of slots, a conventional a.c. armature winding being placed in the bottom of these slots and extending through both cores, with a connection to three-phase slip rings.

For the main core a salient pole field system is provided, the necessary field windings being excited from a separate d.c. armature winding which is placed in the top of the slots and connected to a commutator. The auxiliary core has no salient poles, and the air-gap is thus annular. The only excitation is that provided by the a.c. winding in the bottom of the slots. In the top of the slots is placed a d.c. winding

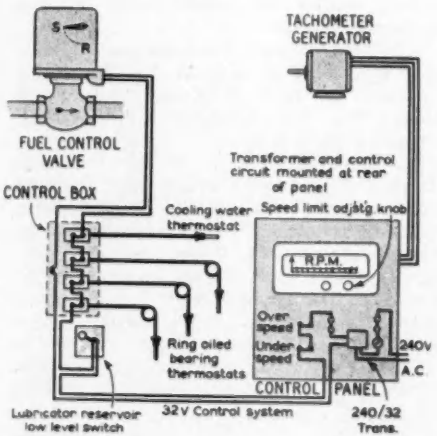


Fig. 2. The schematic arrangement of protective devices in the small power stations is seen above

which is interconnected with the d.c. winding on the main core.

In operation at no-load, the only d.c. voltage appearing at the brushes is that due to the d.c. armature winding on the main core cutting the flux in the salient poles. On load, however, a d.c. voltage is generated on the auxiliary core which is almost directly proportional to the value of the alternating current. The interconnections between the two d.c. circuits are arranged so that the whole of this voltage is added to that generated by the d.c. winding on the main armature when the a.c. load is at zero-lagging power factor. Only a small proportion is added when the power factor of the load approaches unity.

Degree of increase of excitation voltage with increase of load current is controlled by the axial position of the annular core, while the increase with fall in power factor is controlled by the brush position. Careful setting of these two variables ensures that the alternator output voltage is maintained practically constant without movement of the field regulator.

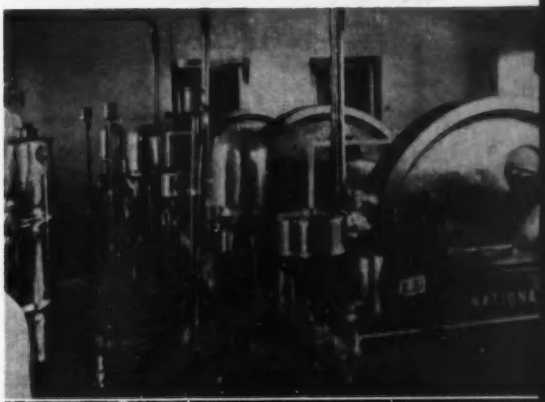
When separate alternators are operated in parallel on no-load, their power factors will not be the same unless the field regulators are carefully adjusted. A circulating current in general flows in the armatures, one machine generating at a low lagging power factor and the other at a low leading power factor. A similar effect occurs when two compensated alternators are paralleled, but the a.c. voltage of the machine generating leading power factor tends to fall away, so that the circulating current increases. With two similar compensated machines this trouble may be overcome by paralleling the d.c. fields, so that the field currents, the internal a.c. voltages and the power factors delivered are similar (Fig. 7).

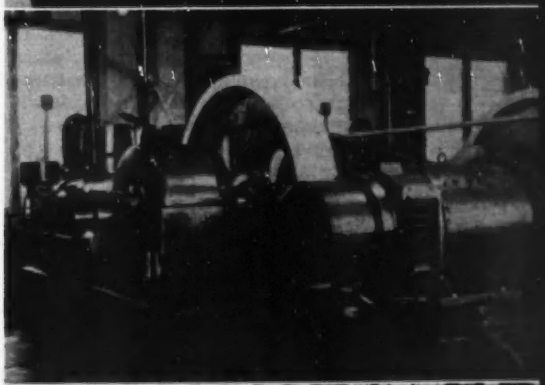
Switchboards

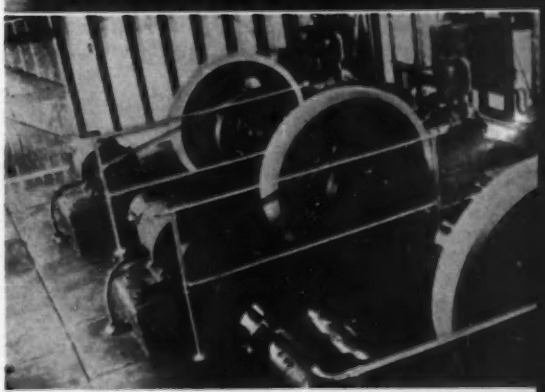
Switchboards are of the open panel type, with projection mounting of apparatus. Only the bare necessities have been incorporated in the design to keep capital costs to a minimum. All the switchboards will be manufactured in Queensland.

Each alternator panel on a switchboard consists of an air circuit-breaker with time-limit overload and no-volt protection (calibrated to operate at 32 amp) an ironclad isolating switch, one ammeter with a changeover ammeter switch, a neutral switch, synchronising plug, power factor meter switch (one p.f. meter for all machines) and a paralleling switch for fields of alternators. Also provided on each board are hour meter (for hours run by each engine), a kWh meter, and a field regulator. Fig. 6).

Looking from top to bottom are seen Fig. 3, the layout of engines from control end; Fig. 4, the same from the alternator end (with controls being mounted on rear wall); and Fig. 5, the general plant arrangement showing belt drive







The feeder panels have triple pole iron clad switch-fuses for all circuits. These circuits in a typical station comprise town feeder, street-light feeder, hospital feeder, water supply and sewerage feeders and station supply. Ammeters are installed on town and hospital feeders, and kWh meters on street-light and water supply circuits. A time switch controls street lighting.

The final type of panel is the station panel. This is equipped with synchronising lamps, a frequency meter, busbar voltmeter, incoming voltmeter and power factor meter.

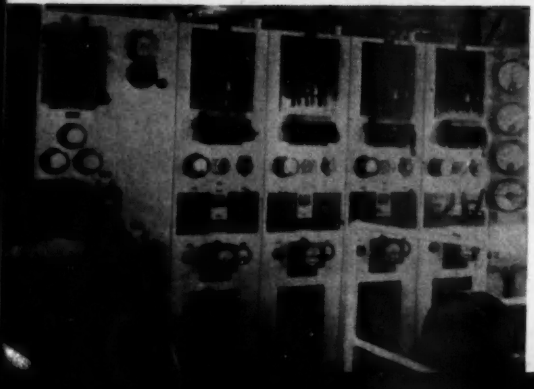
All wiring on the switchboard, except for the bare copper busbars, is carried out in plastic insulated cable. Connections from alternator to switchboard and from switchboard to feeders are also made with plastic insulated cables, these being run in plastic conduit for mechanical protection.

Operation

Co-ordination of the shutting-down of an engine by the automatic protective devices with the disconnection of its alternator from the supply is accomplished by the use of auxiliary contacts on the solenoid fuel valve already described. These contacts are connected in circuit with the no-volt coil on the alternator circuit-breaker. When the fuel valve is closed, the auxiliary contacts are opened and the no-volt coil operates to open the c.b. automatically. Simultaneously, operating coils connected in circuit with the auxiliary contacts in the solenoid fuel valve are energised and open the parallel connection between the fields of the disconnected alternator and those of the alternator or alternators still on load.

Two alarm bells are provided, one in the station and one in the station superintendent's dwelling. These are operated by the mechanical closing of a micro-switch when a circuit-breaker opens. Isolating switches are provided on each alternator panel and for each bell.

Fig. 6. The general arrangement of a typical switchboard for the Western Queensland stations



That power-station buildings are pre-fabricated has already been mentioned. These buildings have asbestos-cement wall sheeting and lining, and give an engine room 38 ft x 28 ft. Office, toolroom and store room are also provided. For the engine room a 6 in. thick concrete floor is provided, special precautions being taken against the ingress of moisture.

To obviate the use of open ducts for cables in the flooring, underground earthenware pipes have been used from the alternators to the

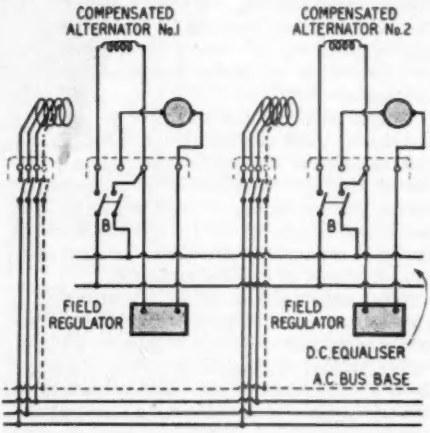


Fig. 7. Parallel connections for two similar compensated alternators are shown

switchboard. This is found to assist greatly in maintaining a clean station. All concrete used inside the station has been treated in the pouring stage to protect it against damage by oil.

Distribution

For each township served by a small station provision has been made for a ring of three-phase mains using overhead lines of heavy copper section to ensure good line voltage regulation. Aerial services are taken to consumers through insulated conductors. To obviate the risk of interruption of the main supply should service wires become crossed, the service fuses are mounted on the distribution poles. All fuses used are graded in keeping with the calibration of the alternator air circuit-breaker. Earthing is on the multiple earthed neutral principle, special care being taken to ensure that minimum earth resistance is obtained. Because of the small capacity of the generating sets, a close watch has been kept on load balance, all motors in excess of one-third horse-power being three-phase machines.

As already mentioned, separate feeders are run for street lighting, water supply, hospitals and sewage works. Street lighting is installed on a scale officially described as "liberal," using conventional bracket-type street lamps.

Staffing

Superintendents in charge of these small undertakings have qualifications as electrical fitters and/or mechanics, and are required to have had experience in the operation and maintenance of diesel engines. In general, they are given the right of private practice. This latter step has been taken for two reasons: first, to make the positions more attractive, having regard to the difficulty in securing skilled workers in remote centres, and secondly, to provide and maintain a service to consumers which, for similar reasons, would not otherwise be available in these places.

At the outset of a scheme, restrictions are imposed on the loading of individual current-consuming devices. Electric cookers, wash boilers and fires, welding sets, and any apparatus rated at more than 2·4 kW or 3 h.p. are not accepted at this stage. An exception is made in such cases as hospitals, water supply and sewage works, where the demand for the heavier industrial loads is restricted to periods suitable to the supply authority.

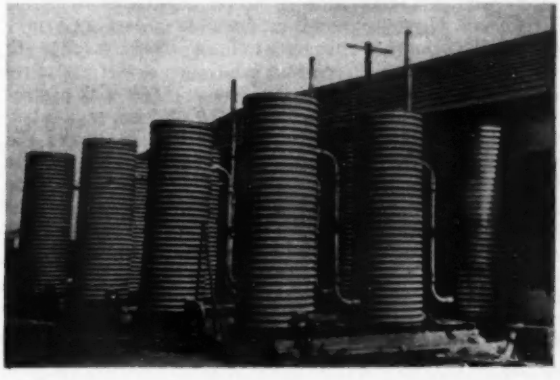
Obviously, with a restricted service of this nature and a relatively small total of potential consumers, much depends on the co-operation of all concerned. In the early stages of a scheme an approach is made to prospective domestic consumers to ascertain their requirements and to secure their agreement to having installation work done by contract under a specification prepared by the State Electricity Commission.

O.H. line distribution in Western Queensland township—showing a corner pole

Assisted wiring schemes are introduced in each town whereby consumers who so desire can repay their respective local authorities the cost of wiring premises by monthly instalments extending over five years, interest being charged at 3½ to 4½%.

Experience so far has shown that in all cases a high proportion of the possible consumers in each town has been connected when the station began operating, and the remainder are being progressively connected. In addition, there has been a demand for the extension of many installations. In general, commercial consumers and others who hitherto have operated their own generating plants are being found as keen to take a supply as those who had not previously been users of electric power.

Fig. 8. This illustration shows a typical arrangement of cooling tanks for one of the small generating stations



Economics and Tariffs

All schemes are designed to be self-supporting apart from the subsidy element, and early indications are that they will prove to be so. Apart from the 60 to 65% Government subsidy for capital charges, local authorities have imposed a rate over the whole of their respective areas to meet the remainder of the capital charges. This is a practical recognition of the relation and importance of the town to its surrounding area.

This view of "Dead Man's Crossing" near Windorah, Western Queensland, gives some idea of the countryside in which the power stations operate

The tariffs decided upon initially are as follows; it must be borne in mind that the figures are given in Australian currency.

Domestic. First 10 units/month, 1s. 4¾d./unit, the next 20/month at 7¼d., the next 150 at 6d., and all over 180 units, at 4¼d.

Commercial Lighting. First 100 units/month at 1s. 4¾d./unit, the next 100 at 1s. 2¼d., and all over 200 units/month at 10¾d.

Commercial Power. First 250 units/month at 8¼d./unit, the next 250 at 7¼d., and all over 500 units/month at 4¼d. For this tariff there is a minimum charge of £1 4s./month.

Street lighting is charged at a flat rate of £12 per lamp, per year. (The approximate value of these amounts in sterling is given by multiplying by 0·8.)

The State Electricity Commission of Queensland has been throughout the moving spirit in these schemes. It has prepared information on many aspects of them, and has formulated instructions and other data for the use of the superintendents in the operation and maintenance of the undertakings. The Commission continues to exercise general supervision over all matters connected with the running of the schemes.

Towns involved in the initial schemes are Tharmogindah, Ilfracombe, Quilpie, Isisford, Richmond, Taroom, Tara, Aramac and Julia Creek. Others on which work is being carried out are Muttaburra, Jericho and Alpha.

Our thanks are due to Mr. H. Neil Smith, the Queensland Commissioner for Electricity Supply for permission to publish this article and for help in preparing it.

ELECTRIC RAILWAYS IN THE HIGHLANDS

INVERNESS County Council recently approached the Railway Executive and the North of Scotland Hydro-Electric Board, with a view to finding out prospects of railway electrification in the Highlands. A reply from the Board indicates that while the decision to electrify would, of course, be a matter for the British Transport Commission, the board was constructing many generating stations and transmission lines throughout the Highlands from which it would be most willing to provide power for railway electrification.

A memorandum on the subject was enclosed with the Board's letter which was submitted to a meeting of the Inverness County Council held last week. This memorandum pointed out that nearly 1,750,000 tons of coal were used in the North of Scotland area, of which some 35,000 tons were used in transporting coal to the Highlands. It was estimated that the cost of electrification of the Highland line between Perth and Inverness would be about £50,000 per mile. The total cost would, therefore, be in the neighbourhood of £6 million, including locomotives estimated at £60,000 each.

With the increasing freight demand, if steam trains were to remain the only means of haulage, it would become necessary to double some of the single tracks. Electric working with its greater flexibility would make this unnecessary, and at the same time would reduce the time of the journey by one-half to one-third. The making of the Perth-Inverness line into a double track system is estimated to cost about £8m.

The changeover from steam haulage to electricity derived from water power would result in a saving of about 25,000 tons of coal annually, or to about £100,000 per year.

In support of their ability to supply the necessary power, the Board pointed out that their present capacity of 391 MW would rise to 1,000 MW in the next ten years. At that time the load was expected to be 750 MW, leaving an adequate margin available for railway electrification schemes.

The proposals are being put before the Transport Commission, and Inverness C.C. awaits a reply before taking further action.

Self-Excitation of Capacitor-Compensated Induction Motors

Estimating the Size of P.F. Correction Capacitors to avoid over-voltages

By J. A. NICHOLSON, M.Sc.*

THE phenomenon of self-excitation of induction motors to which power factor correction capacitors have been connected is well-known. It occurs where capacitors are connected directly to the motor terminals so that both the capacitor and motor remain connected on the motor side of the starter switch. In the past, trouble has been experienced due to self-excitation and has resulted in damage to motor shafts, burning out of lamps, failure of motor or capacitor insulations, spark-over of switch contacts, fuses, etc., [10].

Mechanism of Self-Excitation

The mechanism of self-excitation has been described by Bassett and Potter[1] and others. It occurs under certain conditions when the motor and capacitor are connected together but disconnected from the supply.

The conventional induction motor has a magnetising characteristic as shown in Fig. 1. The voltage/current characteristic of the capacitor is linear as also shown in Fig. 1. If such a motor and capacitor are connected together and to a supply they will each draw a certain current whose magnitude will depend on the supply voltage. If now the supply is interrupted, the machine will continue to rotate. The flux and hence the back e.m.f. of the motor will not collapse instantaneously, so that the back e.m.f. will appear across the terminals of the machine. With the capacitor and motor characteristics shown by full lines in Fig. 1, the magnitude of the capacitor current will exceed that of the motor magnetising current so that the flux will build up and the voltage will increase until the currents reach the equilibrium point at the inter-section of the two curves. If the supply remains disconnected this voltage will gradually disappear as the machine slows down, but if the supply is re-connected, as would be the case in starting up the machine from an auto-transformer starter, a surge will result. This may damage the shaft of the machine if this is connected to a heavy load or the over-voltage may be responsible for breakdown of insulation, etc.

Experimental Investigation

Self-excitation has been investigated experimentally by Bloomquist and Boice[3] and by Wagner[9]. The experiments of the former are more directly applicable to the practical aspect of this problem; Wagner's investigation is more concerned with the characteristics of the induction generator. The problem has also been investigated by Satche[11].

Bloomquist and Boice have connected a 100 h.p. 1,800 r.p.m. 2·2 kV, 60 c/s motor to a supply through an auto-transformer starter. A capacitor of 40 kVAr was connected to the motor terminals. The motor was run up on no load to a speed of 1,775 r.p.m. at 1,450 V from the starter and the supply was then interrupted for a period of approximately 0·7 sec. As

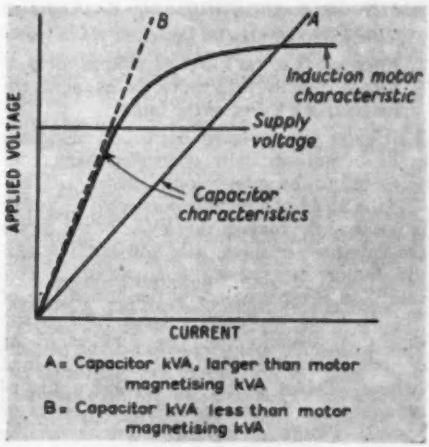


Fig. 1. The magnetising characteristic of a conventional induction motor and the voltage/current characteristic of the p.f. capacitor

* Mr. J. A. Nicholson is with the E.R.A. and this article will be issued as Report Ref. Q/T138.

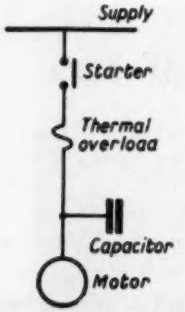


Fig. 2. Schematic diagram showing the manner in which the capacitor is connected to the motor

determined from an oscillogram, the motor voltage rose from 1,450 V to 3,140 V and became 252° out of phase with the supply during this period. On re-connection to the 2,200 V supply the speed dropped sharply to 1,320 r.p.m. and then rose to its previous value of 1,775 r.p.m. It was calculated that the maximum torque developed in this transient was 21 times the rated torque. The capacitance of 40 kVAr was such as to correct the power factor of the motor to unity.

It is seen that the motor voltage built up to a value 140% of the nominal supply voltage. This could equally well occur if the supply had been interrupted at the substation, in which case the whole of the system would have been subjected to the over voltage. A supply failure at the sub-station could thus account for the burning out of lamps, and spark-over of switches and fuses to which reference has been made[10]. In such an event the duration of the over-voltage would not be great since the machine would slow rapidly due to the heavy load.

Methods of Avoiding Self-Excitation

Self-excitation may be avoided by :—

1. Ensuring that the kVAr of a capacitor connected directly to a motor is less than the magnetising kVAr of the motor.
2. Installing power factor correction capacitors in an automatically controlled bank connected to the sub-station busbars.

If the kVAr of a directly connected capacitor is less than the magnetising kVAr of the motor the capacitor characteristic will not intersect the motor magnetising characteristic. This condition is represented by the dotted line of Fig. 1. Code of Practice, CP.321.102[5] states that this condition will be fulfilled if the capacitor current is 85% of the motor no-load current. Tables giving the maximum size of capacitor for direct connection to motors of various speeds and ratings are given by Bloomquist[2]. While these are for 60 c/s motors, factors are given for conversion to 50 c/s motors. Jones[7] gives a shorter table which covers a limited range of motors.

When capacitors are connected directly to motors in the manner shown in Fig. 2, it may be necessary to re-set the overload trips in the starter as the current drawn by the motor and capacitor will be less than that of the motor alone. The tables given by Bloomquist[2] also indicate the current reduction to be expected.

The installation of an automatically controlled bank of power factor correction capacitors will also preclude self-excitation, as here the capacitors are not directly connected from the motor and are isolated from it when the motor is switched off.

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St. Lawrence—a Further Stage

NEWS that the U.S. Federal Power Commission has issued a licence nominating the New York State Power Authority to operate with the Hydro-Electric Power Commission of Ontario leaves the way clear for the development of the power side of the St. Lawrence Seaway Project. Although the nomination has yet to be approved by the U.S. Government and subsequent legal formalities observed before a start may be made on this 2·2 million h.p. scheme, it now seems possible that next year will see tenders for the hydro-electric work being invited. Development of this side of the scheme is an urgent need of the Hydro-Electric Power Commission of Ontario.

From AN ENGINEER'S NOTEBOOK

IT is a matter for speculation whether the benefits that will be conferred on civilisation by the science of nucleonics (horrible word) will derive mostly from the use of atomic power or from the ready source of radio activity and radio-active materials which the piles provide. If I were a betting man I would lay heavy odds on the latter. Already the applications of radio-active materials cover an immense range, yet we are hardly on the threshold of the ultimate possibilities. One of the latest lines of investigation is concerned with the effect of high energy radiation on the structure of the complicated atoms of modern plastics. In the case of one thermo-plastic, it was found that radiation "fixed" its physical shape and although on heating the form could be distorted and fixed by cooling, on subsequent heating above the plastic temperature the former shape would automatically be resumed. Again, Perspex, when it is irradiated, loses its transparency and becomes a white brittle material, while with higher intensities it becomes a white powder. The strangest phenomenon, however, is found on subsequently heating irradiated Perspex. When a critical temperature, depending on radiation dosage, is exceeded, bubbling takes place within the plastic and it expands to six to eight times the original volume. What the ultimate commercial applications of such properties may be, must be left to the future, but it has been suggested that Perspex might make a useful heat insulant by placing suitable irradiated material in position and by subsequent heating it could be expanded to fill the available volume.

* * *

THE mention of electrostatics always takes me back to the early days of "mag and elec," when we played with pith balls and electroscopes in the school laboratory, for electrostatics has had relatively little impact on engineering, compared with that of magnetism. There has been an incursion of electrostatics into the field of measurement and more recently we have become familiar with precipitation methods for dust, and the use of charged plates for electron control, but little more than this outside the laboratory. However, it seems likely that the engineer will have to pay more respect to electrostatics in the future for it is finding ever increasing scope. One of the current advances which may well have a pronounced effect on future development is the introduction of the "electret," an electrostatic equivalent of a permanent magnet. These electrets are produced by allowing an insulant such as carnauba wax, when in the liquid state, to solidify between two plates subjected to a potential difference of some 5000 V. If the positive charged plate is then removed, the surface beneath is found to carry a negative charge of about half the charging potential. This voltage is found to rise slowly, through zero, until after about two weeks it will have gained a positive value of something less than half the charging potential. The distinguishing feature of this charge is its semi-permanent character, taking a year or more to fall to half its maximum value. What is more, should the charge be dissipated, the surface potential will again of its own accord rise to a maximum value and then continue its slow exponential decline.

* * *

PERHAPS I may refer to one other development in the use of electrostatics which although by no means a new idea, is being developed to a point of practical use. It has long been known that certain materials become conductive when exposed to light and this property has been exploited to provide a method of electrostatic photography. For this purpose a suitable plate of conducting material is coated with anthracene sulphur or similar photo-conductive material and then a potential is applied evenly over the whole surface by means of a discharge from pointed electrodes. The plate is then ready for exposure in a camera, when the surface will be discharged in proportion to the light falling on it, so as to provide an electrostatic image of the required picture. Development of this latent image is effected by dusting with a charged powder and the plate may then be used for the production of contact prints. I cannot help thinking that the method has decided limitations compared with existing methods of photography, but it has the merit of quickness and the avoidance of wet development. Further, by the use of powders of different polarities, either a positive or a negative image can be developed.—*E.R.G.*

4,500 lb—1,050°F. Reheat

NEW AMERICAN PLANT USES DOUBLE REHEAT CYCLE TO BETTER 40% EFFICIENCY.

RADICAL changes in conventional design features are to be introduced into the new 125 MW unit scheduled for the Philo Station of the Ohio Power Co., one of the three principal groups in the American Gas and Electric System. The main deviation from normal practice lies in the steam cycle to be adopted. With a turbine stop valve pressure of 4,500 lb/sq in. at a temperature of 1,050° F. the unit is believed to be unique for its size. As the pressure is well above the critical pressure of 3,206 lb/sq in. the boiler unit can be of the "once through" type, thus eliminating the need for the heavy and costly drums needed for evaporative type boilers. It should, however, be recalled that boilers operating at or above the critical pressure of water have long been considered, and as far back as 1934 Benson boilers, using the "straight-through" principle, were operating in Europe.

The proposed cycle lay-out is shown opposite This is still in its preliminary form and may require modification before the actual design is finalised. It can be seen, however, that the salient features include double reheat, seven stages of feedwater heating and low and high-pressure feed pumps. It is hoped to attain an efficiency of conversion from heat to electricity of over 40% with this unit.

Boiler Plant

The Universal Pressure steam generator will be provided by Babcock and Wilcox. This will be the first time that this form of generator has been used for large-scale power production in the United States. In this generator, water is pumped in at one end, flows through numerous tubes in parallel and emerges at the other end in the form of superheated steam. To ensure a uniform and predictable flow of water between the tubes, a high pressure drop of 1,000 lb/sq in. is taken between the feedwater inlet header and the superheater outlet header. At full load, therefore, the feed pumps must supply water at 5,500 lb/sq in. To withstand this pressure, the entire high pressure side of the generator, except the headers, is made up of small diameter tubing of considerable thickness, varying in composition from carbon steel at the inlet to stainless steel at the outlet. As there is no need for the usual static head to provide circulation and separation of steam and water the steam generator can be made compact, thus reducing building volume—a major advantage.

Rating at full load is 675 klb/hr with two reheats, one of 615 klb/hr at 1,150 lb/sq in. from 800° F. to 1,050° F., and one of 525 klb/hr at 165 lb/sq in. from 630° F. to 1,000° F. Some 81% of the total heat transferred to the working "fluid" will be used for superheating alone, in the main superheater, and the reheaters. It is thus obvious that the term "boiler" is scarcely applicable to this type of unit.

Furnaces

Cyclone-type furnaces, using crushed coal, will be used—three cyclones feeding the boiler. The liquid slag will be tapped out of the cyclone chamber into the small primary furnace, into which the cyclones fire, and thence to a water-filled slag tank.

Gas leaving the primary furnace will be mixed with cool recirculated gas to give a temperature of 1,900° F. before the mixture enters the convection surfaces. By this means it is hoped to ensure clean surfaces in the convection pass. Gas leaving the superheater and reheat surfaces, passes party to the recirculation fans, but the greater part of it passes to a tubular type air heater, and thence to induced fans and the stack. No separate flyash removal equipment will be provided as the Cyclone furnaces will remove all but a small amount of exceedingly fine ash, which will be easily dispersed by high stack velocities.

Control

Pressure control in the steam generator is by the discharge pressure of the feed pumps. A pressure regulator at the turbine throttle will therefore control pump speed rather than the firing rate as in other installations. The heat input to the unit will primarily be dependent on main steam flow and temperature. Reheat temperatures will be adjusted by the interaction of dampers in the gas passes leaving the reheater and superheater surfaces.

Special provisions must be made for starting, and to this end automatic recirculation valves will be provided to allow fluid circulation to

take place. The fluid circulated passes to the deaerator which will pass excess heat in the form of saturated steam to condenser. Carefully controlled desuperheating equipment will be used to prevent superheated steam reaching the deaerator or the condenser.

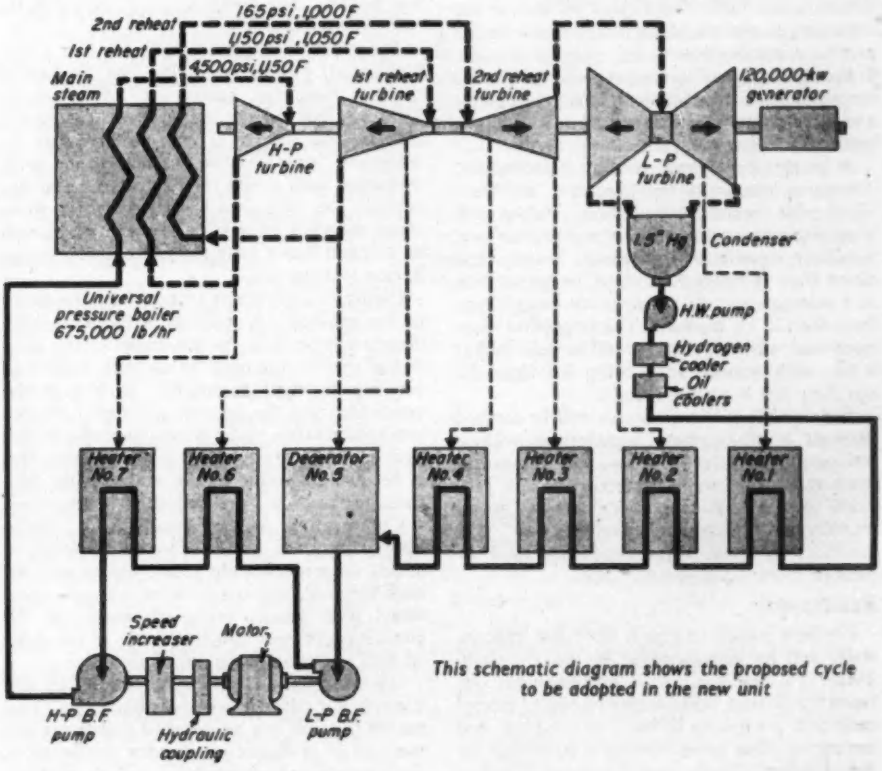
Turbine Design

The turbine, to be manufactured by General Electric will run at 3,600 r.p.m. and consists of a special h.p. unit in tandem with a reverse-flow type. The main steam will flow through four inlet pipes to four pairs of stop and control valves located under the front of the machine. These control valves will be of the throttling type to vary the load on the machine by altering the inlet steam pressure to the first stage.

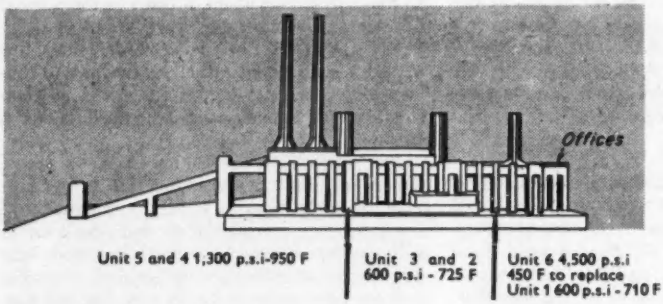
At full load, steam will be exhausted from the h.p. turbine at 1,225 lb/sq in., and will return to the steam generator where it will be reheated to 1,050° F. It will then re-enter the mid-section of the h.p. rotor of the reverse-flow section and pass forward before exhausting to the second reheater at 185 lb/sq in. Returning to the mid-section again, it flows in the normal direction before passing over to the double-flow exhaust section. Intercept valves are placed in each of the "hot" reheat lines to prevent overspeeding of the set from residual steam in the reheat sections in the event of a trip-out.

The stop-valves, control valves, steam pipes, flanges and part of the inner shell of the h.p. turbine will be made of austenitic material, and work is being carried out to find whether this will also be necessary for the h.p. rotor. The double-shell construction will be used to enable conventional material to be used for the h.p. cylinder as far as possible.

Apart from the normal controls, additional equipment will be required to operate the two sets of reheat stop and intercept valves, and an initial temperature regulator will be needed to close the stop control valves should the temperature fall too low or too fast. This is to protect both boiler and turbine in the event of such conditions as sudden loss of fires, when water might be carried over.



This schematic diagram shows the proposed cycle to be adopted in the new unit



This line drawing gives the outline of the Philo Station showing the location of the existing sets and the site to be occupied by the 125 MW unit: this replaces a 40 MW existing set

Alternator

The main generator will be hydrogen cooled and designed to operate at 30 lb/sq in. gas pressure to obtain the maximum rating. At the moment a tentative figure of 120 MW at 0·85 p.f. has been selected. However, the necessity for installing the machine in the space already occupied by a much smaller generator will dictate the final design features. Investigation is being made into the use of hollow, direct-cooled rotor conductors to reduce the rotor length, and the stator design is also under careful consideration. Until these points are finalised, the actual generating voltage cannot be established. Excitation will be provided by a separate rotating machine using an amplidyne system for voltage regulation.

A single three-phase step-up transformer, directly connected to the alternator, and provided with forced-oil, forced-air cooling, will couple the set to the 132 kV station busbars. Auxiliary supplies will, however, be provided direct from the alternator leads, or for starting and emergencies, via a step-down transformer from the 132 kV busbars. The larger and more important auxiliary motors will be operated at 4 kV, with smaller units being fed from the auxiliary 500 V station system.

The neutral of the generator will be earthed through a single-phase transformer with a resistance connected across the secondary winding, and lightning protection will be provided on the high side of the step-up power transformer. Following present day U.S. practice, however, surge protection will be omitted from the generator itself.

Feedwater

The feed-pumps to supply the 5,500 lb/sq in. water will be manufactured by the De Laval Steam Turbine Co. Two arrangements are being considered, both using two sets of pumps each with a capacity of 60% of full load, and having variable speed hydraulic couplings for the variation of boiler steam pressure. The first arrangement is as shown in the diagram, where feedwater is taken from the de-aerator by two constant speed barrel-type pumps of normal design, and boosted to 2,000 lb/sq in. After passing through two heaters, the water at about 515° F enters the two new variable speed h.p. pumps which raise the pressure to 5,500 lb/sq in. It should be noted that both sets of pumps are driven by a common motor, and that this arrangement avoids the use of h.p. heaters. The pump duty will, however, be much more arduous.

The other arrangement calls for two single high-speed pumps, pumping the feedwater through two h.p. heaters at 5,500 lb/sq in. Although this reduces the number of pumps it involves the design of h.p. feed heaters to withstand pressures of 5,500 lb/sq in. with feedwater with a pH of 9·2 to 9·5. The de-aerator, too, will need special design to withstand the slugs of steam and water which will be dumped into it from the recirculating valves during starting up.

Owing to local water scarcity and the desire to use existing c.w. tunnels, a two-pass condenser will be used. In the design of this condenser special care must be taken to make it as hermetically tight as possible, as it is in the condenser that the greatest possibility of contamination exists, and it is most desirable in this cycle to keep make-up water to a minimum. This is because all solids in the water must pass through the cycle or be deposited in the tubes.

Commenting on the project, Mr. Philip Sporn, reported in the *Electrical World*, in which fuller details are given, stated that the high-pressure, high-temperature technique combined with reheat, made efficiencies, in the conversion of heat into electricity, of the order of 50% a distinct possibility.

We understand from the American Gas and Electric Co. that it will be about two years before the unit can be installed and that when the unit is in operation, further details of its final design and performance will be released.

PROBLEMS AND PRACTICE in Engineering

Resistance Fault

A CRANE, operating at 230 V d.c., rating 30 tons, whose duties for many years had been the handling of loads considerably less than its capacity, was at last being utilised to lift up to 30 tons. The crane driver, after several of these heavy hoists, complained that he had difficulty in controlling the load without swing, due to the hoist motor not pickirg up until the 3rd or 4th controller notch had been passed. A tong-test ammeter revealed that up to notch 3 the motor current only reached 100 amps, when lifting the 30 ton load, whereas the full load current for the 30 h.p. motor (110 amps) should at least have been passed on the 1st notch.

The c.i. resistance grids were examined and, although buckled in several places, appeared in fairly good condition until some adjustment of the step values, by moving the cable connections along the grids, revealed loose connection between grid faces with the connection clamps partially welded between them. The total resistance measurement was 5·0 ohms, about twice the value required to pass full load current on the first step. On the light loads handled formerly, this high resistance had not affected the motor starting, as the 40/50 amps passed on the first notch was sufficient to start and accelerate.

As a temporary measure the grid clamping bolts were fully tightened and the step cable connections, moved to give roughly between steps 0·6; 0·5; 0·4; 0·3; 0·25; totalling 2·05 ohms. A full load lift was then made, the motor getting away slowly on the 2nd notch and building up speed on succeeding ones until full out ; the resistance temperature, however, became very high due to the number of grids cut out when adjusting the values.

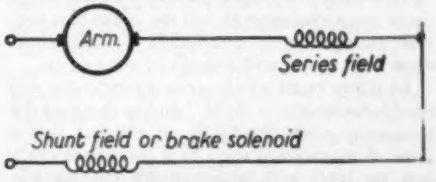
The resistance frame was then taken down and completely stripped, when the grid clamping faces were found to be badly burnt and pitted. These were re-faced by grinding, and the whole reassembled, using spacing washers where necessary to make up the correct distances between grids, lost when re-facing. The grids had formerly been clamped together by long insulated bolts with no provision for expansion and contraction, so heavy springs were now fitted in place of packing washers at one end of each clamping bolt, as it was evident from the grid distortion and the arcing that had taken place between joints that expansion and contraction had been responsible, and that the fitting of suitable compression springs would maintain a more reliable unit.

The ohmic value of the complete frame between sections, after this repair, was R1-R2, 0·61; R2-R3, 0·48; R3-R4, 0·375; R4-R5, 0·29; R5-R6, 0·25; totalling 2·005 ohms. The hoist motor on load now crawled on the first notch and accelerated between each succeeding step. The resistances of the travel and traverse motors were examined later and found in a somewhat similar condition and were duly treated in a like manner.—*T. H. Snelson.*

Motor Breakdowns

IN "Problems and Practice" on June 11 and July 2 there appears some discussion of the breakdown of a motor armature when its field circuit was broken, and the possibility of this being due to induced e.m.f. in the armature.

The ratio of field turns to armature turns in a normal shunt machine is such that the self-induced e.m.f. in the field coil would be altogether excessive long before the mutually induced e.m.f. in the armature had reached the danger point. Undoubtedly the cause is the high induced e.m.f. in the field coil.



Moving starter switch to "off" position connects fields and armature in series, as shown above, giving rise to failure of armature insulation due to e.m.f. in shunt field winding

I had experience of a similar case several years ago. A 460 V crane motor armature broke down on successive occasions, and there was always a small puncture at some point such as one gets from a high voltage. An investigation was made on the crane and it was found by using neon lamps in series that over 1,200 V was developed at times in a brake solenoid

when the controller was bought to the "off" position. We fitted a discharge resistance to this coil and so far as I know the trouble has not recurred.

The interesting point about this example is the obvious fact that there could be no question of an e.m.f. being induced in the armature by the brake solenoid. It is a long time ago now and I cannot remember details of the controller, but usually one line is common and is not broken during operation. It can be seen from the diagram above that an e.m.f. in the coil could quite easily cause a corresponding p.d. between armature and core and one would expect a field or brake coil to stand up better than an armature to this high voltage.—*M.C.*

Checking Time Standards

THE radiating by the B.B.C. of time-signals, and the aid given by "TIM" of the telephone service, have been a great boon to those who have in their keeping precision time-keepers such as pendulum clocks and ship's chronometers. In many establishments it has become the accepted routine to make a daily check of the time standard(s) and to keep a log of the errors.

This practice serves a number of valuable purposes. It provides an up-to-date correction so that true time can be given upon demand. It also enables the "drift" to be noted and in this way early warning of a developing or incipient fault, or of untoward external happenings, given; the latter can include temperature and atmospheric variations, physical shocks of various origins, failings in an electrical auxiliary supply, and unauthorised interference of one kind or another; not all of these are under control, but the cause of a sudden change in a time-standard's behaviour should be found and logged.

In many parts of the country recourse can readily be made to "TIM," and in this case the telephone point should be so situated that a fixed time-standard such as a pendulum clock can be read with accuracy by the listener. Alternatively, or preferably additionally, a radio receiver should be available.

In the writer's experience it once became necessary to dispense with the radio receiver which had been specially installed—one reason being that the set was unduly patronised as a "Music while you work" aid.

A one-valve receiver, with simple fixed inductance suited to the local B.B.C. transmitter and complete with 3 V dry battery for filaments and 10 V dry battery for anode, was neatly installed in the base of the master pendulum clock. Leads were unobtrusively run to aerial in the roof void and to the "earth". A pair of headphones was jacked into the side of the clock and a bell-switch in the filament circuit was made available 3 ft in front of the clock. This arrangement served well and very cheaply for several years.—*G.E.M.*

Don't Blame the Cooker!

IN the daily course of work, many curious faults are presented to the electrician, yet even the most awkward are capable of simple explanation. Such a case occurred recently where a client was persuaded to invest in an electric cooker in preference to the existing gas unit, and in due course the installation was completed, the cooker stood ready for use, and everything was in order.

Nevertheless in a few days complaint was received that the radiant heat boiling plates were not providing sufficient temperature rise and were taking too long to prepare food. Inspection and test showed that the surface temperature was correct, the circuits were correct and no electrical fault could be diagnosed. Later on the complaint was repeated and again tests were made without trace of fault, but in this case new plates were fitted to ensure success.

At this point it would seem that all possibilities had been provided for, but once again the complaint was made and on this occasion a practical test of exact operating conditions was proposed to finally eliminate this elusive fault condition. However, such a course was not necessary for on producing the pots and pans normally used it was found that these were of a special design to use the gas flame to the best advantage, this being accomplished by making the base of the pot of an inverted concave form from the rim of the base. Thus although the gas flame would spread outwards the electric radiant heat elements would only contact a very small area of base and an air gap then existed between the two, bringing with it a consequent heat loss.

It was considered unlikely that flat plate elements would give the fullest efficiency with such utensils. Therefore it was recommended that the correct appliances be used and this proved to be the cure for a rather unusual occurrence.—*J.R.*

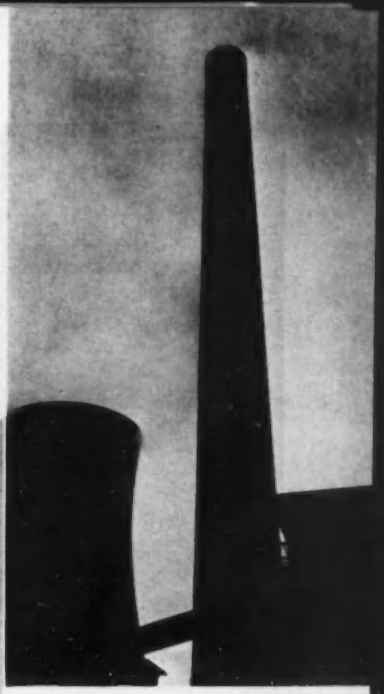
Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Problems of a practical nature to which a solution is required will also be considered. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication

16 JULY, 1953

Preventing Pollution of the Atmosphere

FLUE DUST ELECTRO-PRECIPITATORS AT HUNCOAT STATION

(B.E.A. North Western Division)



IN view of the great importance nowadays attached to prevention of atmospheric pollution, it will be of interest to give a short description of the Simon-Carves flue dust electro-precipitators installed in the first section of the new Huncoat power station at Accrington. The station at present contains three 305,000 lb/hr pulverised fuel-fired boilers which are served by three electro-precipitators; all three boilers are now steaming, and the third precipitator was recently commissioned.

General Arrangement

Each of the three boilers is served by one twin-flow electro-precipitator with horizontal chambers working in parallel, each chamber providing two zones of treatment in series. The precipitator casing and hoppers are constructed in reinforced concrete, and a continuation of the concrete structure forms a weatherproof housing enclosing the tops of the precipitators and running the full length of the precipitator annexe. The houses for the high-tension electrical equipment are at ground level in front of the casings.

Within each treatment chamber the receiving and discharge electrodes are arranged parallel to the gas flow. Each zone has a separate h.t. connection to one of the two rectifier sets so that the inlet and outlet zones are supplied independently with h.t. current at optimum voltage; the zones can, however, be interconnected for emergency operation or for maintenance by means of an oil-immersed shockproof h.t. selector switch.

The receiving electrodes are of the high-efficiency type whereby the entrained dust is precipitated and falls into the hoppers outside of the gas flow without any re-entrainment or creeping-by of carbon particles. Each line of receiving electrodes is mechanically linked and connected to rapping gear on the outside of the precipitator chamber. The rapping gear comprises a number of spring-loaded hammer bar mechanisms by means of which the lines of electrodes are rapped individually in sequence.

Fig. 1. Above are shown two photographs showing the stack without (left) and with precipitators in action for five minutes

Rapping Mechanism

The rapping mechanism for the discharge electrodes is entirely separate, and since these electrodes are charged to a high potential the drive is electrically insulated. Each discharge frame is rapped by means of free-falling hammers actuated in sequence by a simple link mechanism housed in the insulator chamber and operated through a chain drive from a geared motor reduction unit. The line of rapping hammers is supported on the main support frame, which is suspended through vitreosil insulators mounted in the box girders

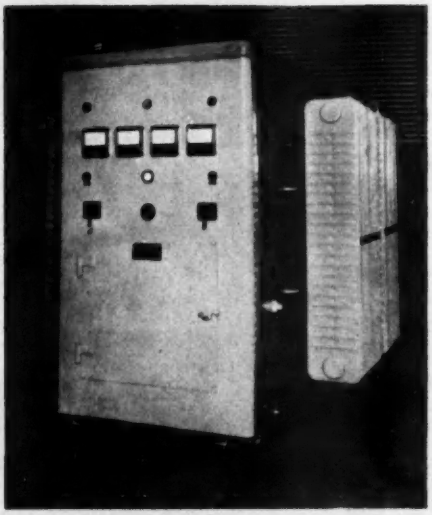


Fig. 2. A Simon-Carves-Ferranti shockproof h.t. rectifier for electro-precipitation

overhead. The discharge electrode frames themselves are suspended centrally between the receiving electrodes and are constructed as rigid frames built from welded tubing with electrodes positively located in the framework, the object of this construction being to give taut electrodes which can be efficiently rapped and to eliminate heavy weights and the risk of electrode swinging.

It will be seen from Fig. 3 that the electrodes are suspended so that their tops are in close proximity to the roof, thus ensuring that all the gas receives treatment in the precipitating electric field. This view also demonstrates the accessibility of the electrodes for maintenance or inspection, the platework casing over the tops of the electrodes being constructed in easily removable sections.

The discharge electrode frames are supported at each end by the braced steel framework referred to, which is suspended from vitreosil support insulators as shown in Fig. 5, set in box girders spanning the precipitator side walls. The underside of these girders is in contact with the hot gases so that the temperature within them is maintained sufficiently high to prevent condensation on the insulators. Dust is prevented from rising and settling out on the inner surfaces of each insulator by allowing a slight flow of air from the insulator chamber downwards through the insulators.

Power Supply

Each rectifier house, one of which is pic-

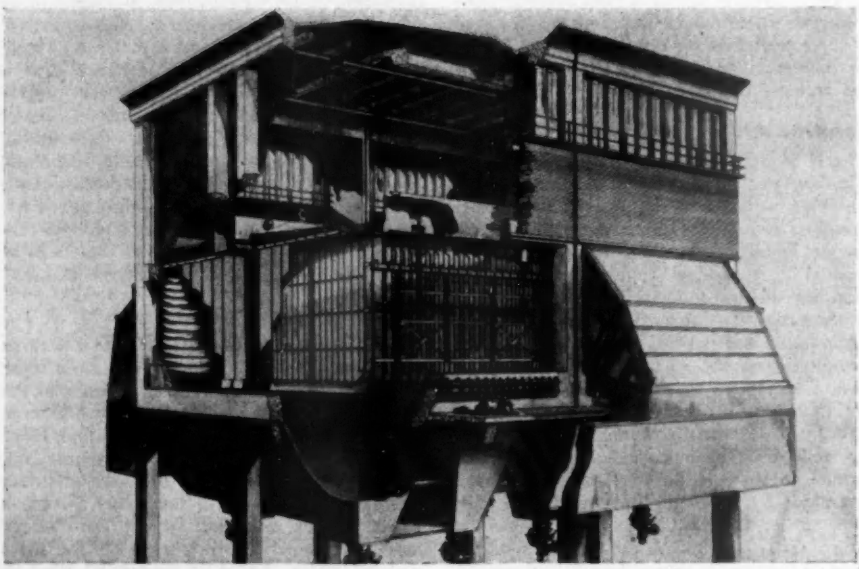


Fig. 3. This cutaway view shows the internal construction of a precipitator unit

Figs. 4 and 5. On the right is a view of the precipitator house taken during erection, and below the h.t. units are shown in their compartments

tured from outside, contains two Simon-Carves-Ferranti shockproof h.t. sets, one oil selector switch, and a group rapper motor control board. Each rectifier is rated at 250 mA, 60 kV, and forms a self-contained unit in a steel plate tank mounted on rollers; the unit comprises a motor-driven moving-coil regulator, step-up transformer and banks of selenium rectifiers, together with the usual voltage doubler capacitors and protective resistances, the low voltage control gear and instruments being housed in the front portion of the tank. All the high-tension equipment is oil immersed. Since the static rectifier does not call for any visual setting, remote control causes no complication, so that in addition to manual control on the front of the rectifier sets, remote control is provided to allow the sets to be normally operated from the boiler control panel on the firing floor. Indications of the kilovolts and milliamps taken by the two precipitating zones are also included on separate instruments with the boiler control panels.

This type of h.t. equipment was first used by Simon-Carves some twenty years ago and has been found eminently suitable for this class of work. The units are completely silent in operation, are shockproof, and require no special screening to give protection to operating personnel.

On one of the h.t. sets at Huncoat two new devices have been fitted. The first is automatic high-tension voltage control, and the second is a device which automatically re-closes the circuit breaker if this should trip out under unstable gas conditions. The fitting of these two devices practically eliminates manual control inasmuch as the high-tension supply to the electrodes is automatically maintained at its optimum value and adjusts itself to suit the varying conditions experienced in hour-to-hour operation. Hence the precipitators are always working at their highest efficiency.

Test Performance

Early in the present year an official test was carried out on the first two precipitators, the test being made after the plant had been in continuous operation for six months and without preliminary cleaning of either the boilers or the precipitators. The efficiency guaranteed by the manufacturers was 98% at maximum continuous boiler rating when handling 142,500 cu ft of gas per minute. The efficiency actually achieved was 99·4%.

Acknowledgments are made to the B.E.A. North Western Division and Messrs. Kennedy and Donkin, consulting engineers, for permission to publish figures of official test.

It should be remembered that the general appearance of a power station stack when the station is under load does not always give a true indication of the precipitator efficiency. The visual effect of the precipitators is, however, particularly well shown in the two specially taken unretouched photographs shown at the beginning of this article.

Industrial Uses of Television

Review of the Facilities Available with Modern Technique

THE use of television as an entertainment medium has somewhat overshadowed its potential capabilities in the industrial, medical and commercial fields. There are, however, many applications in which television or television techniques can be used to great advantage. On the other hand, in some cases, particularly in the U.S.A., the enthusiasm of the electronic engineer has resulted in television being applied to perform functions which can be carried out in a far more simple manner, by optical or other means.

Advantages of Television

When considering the function which television can perform in industry, it is essential to remember the advantages and limitations of the technique. First there is its use in circumstances where, due to space limitations and conditions, or the presence of potential danger may make the actual presence of a human observer undesirable. Such circumstances occur in the lighting-up of oil-fired furnaces, where explosive conditions may readily develop unless the main and pilot burners are closely observed and controlled. Another is in the observation of switchgear under test where a failure might result in an explosion. Restricted space or difficult access situations are exemplified by the remote observation of boiler drum water levels and by the installation of miniature colour cameras above operating tables so that students can watch the operation without necessarily being present in the theatre.

Second, there is the faculty of television for transmitting information. Documents located at one place may be examined or read at another through a closed circuit. In America one railroad company uses a fixed camera in a shunting yard to transmit the identification numbers on trucks to a central control. Care should, however, be taken to assess the economy of television when this type of application is considered, as remote indication and optical methods may frequently be cheaper.

The third group of faculties are those of gain, contrast, and response which television techniques can afford. In many cases these are mainly of scientific use such as in the flying-spot microscope where specimens can be examined unstained and alive. These functions are also being put to good effect in film making, where the scene being 'shot' can be monitored and simultaneously recorded on to standard film stock. Here, contrast is a major consideration, as directly exposed film requires a contrast of about 40 to 1 (linear) in the release film —a figure not always readily obtainable. With the television circuit, however, contrast can be controlled and a range of 40 or 50 to 1 presents no major difficulty. The question of definition naturally arises but a system using sequential (instead of interlaced) scanning and having between 1,000 and 1,300 lines per frame should be quite satisfactory. As, on a closed circuit system, bandwidth limitations do not arise, a bandwidth of 15-20 Mc/s can be used.

The Image Converter

An image converter functions by means of converting an optical image, focused on a transparent conducting photo-electric layer inside the tube, into photo-electrons, which are then accelerated down the tube on to a fluorescent screen. They can be focused and controlled as in the normal cathode-ray tube, and thus when they impinge on the sensitised screen, give a magnified image of considerable intensity. By introducing a control grid such tubes can be used as stroboscopes, the duration of the pulse applied to the grid being variable from 1 millisec to 1 microsec at a repetition rate between 12 c/s to 100 kc/s.

Other functions of the image converter include the intensification of X-ray images, and by means of a suitable choice of material for the photo-sensitive surface the tube can be made to respond to wavelengths invisible to the eye. In the rolling of steel strip, for example, variations in temperature can be noted down to about 300° C, and similarly photographic processes, carried out in infra-red light, may be observed using either a television camera or an image converter.

At the other end of the spectrum, sensitivity to ultra-violet light can be obtained. This is particularly useful for certain types of microscope work. Further particulars of the use of television techniques in science and industry may be obtained from the article by Dr. R. C. G. Williams in Nos. 3 and 4 of the *Journale des Télécommunications*.

Checking for Moisture in Insulation

E.R.A. Equipment to Detect Incipient Breakdown

LAST week we summarised an E.R.A. Report which described an amplifier for detecting ionisation in voids. Complementary to this work is the research which has been carried out on the detection of moisture in fibrous insulation. An account of this work is given in Technical Report V/T108 (Detection of Incipient Failure of Insulation by Observations of Non-Linearity by G. Mole, PH.D., F.INST.P., price 24s.).

Basis of Test

The relation between current and voltage is regarded as linear when the change in current, consequent upon any change in voltage, does not depend on the magnitude of the voltage within the range considered. In many cases, non-linearity can occur, and this may be 'discontinuous' (such as when discharges occur within voids) or 'continuous' when the deviation from linearity is continuously distributed over the applied waveform or over a substantial part of it.

It has been shown that observed variation of the power factor of moist paper with stress can be explained on the basis of two independent effects arising from the presence of barriers. These are (a) an increase in ionic concentration with stress, due to the removal of ions of appropriate sign from the layer of dielectric adjacent to the barrier during part of the cycle, and the consequent reduction in the rate of combination of positive with negative ions, and (b) restriction of the motion of the ions by contact with the barriers at the peaks of the applied waveform.

Thus non-linearity due to these causes may be used as a means of detecting the presence of ions from moisture or other sources in insulation containing suitable barriers, provided the frequency spectrum of the test waveform is suitably related to the time taken by ions in travelling between barriers. Impregnated paper insulation is known to behave in this way and to have barrier separations of a suitable order or magnitude for observation with an applied voltage at 50 c/s.

Method of Test

The principle used consists of applying a pure 50 c/s sinusoidal e.m.f. to a circuit including the test specimen and in observing the generation of voltages at other frequencies. Should the specimen be non-linear, transients will arise which are capable of resolution into a spectrum extending into radio frequencies. However, if the specimen is continuously non-linear, only harmonics of 50 c/s will be generated. Discontinuous non-linearity may therefore be detected by observing the generation of r.f. components while continuous non-linearity may be detected by observing the generation of lower order harmonics (in the absence of r.f. components) or of a magnitude greater than can be correlated with the latter should they exist.

The circuit finally adopted for this test consists of a system of filters for removing (a) the r.f. components and 50 c/s harmonics from the sine wave applied to the specimen and (b) the 50 c/s component from the signal fed from the specimen to the amplifiers and the oscilloscope. The filters are designed to accommodate only the band 100 ± 5 kc/s and the third harmonic of 150 c/s. The design and performance of the 100 kc/s amplifier together with its input circuit were described in the paper summarised last week.

Sensitivity

Because non-linear effects in dielectrics may be expected to be small, and because a small volume of deteriorated insulation may often be associated with a large amount of healthy insulation, the sensitivity of the test must be as high as possible. There is, however, no difficulty in providing as much amplification as is needed, and the sensitivity is therefore limited by other factors, principally the thermal agitation noise.

Further, as both continuous and discontinuous non-linearities generate harmonics, in order to attribute the harmonic to the former it is necessary to consider whether discharges, not detectable as such, can yet give rise to a

detectable harmonic. With the circuit described in the report, continuous non-linearity beginning at voltages above the discharge-inception level, cannot be separated from discontinuous non-linearity, although modifications to the circuit to permit of such separation may well be possible.

For high values of test voltage (1 kV to the discharge-inception voltage at 14-18 kV) the residual harmonic increases at a rate roughly proportional to the square of the test voltage. This is due to an inductance within the test circuit itself, and work is proceeding to reduce this to smaller dimensions, or to differentiate its effect from the test.

Test Results

Initially, tests were carried out on artificial specimens—sheets of fibre and of resin-bonded fabric and unpolymerised resin-bonded paper tubes. The fibre and paper tube specimens were chosen for the first tests because they were similar in properties to paper insulation and because changes in water content could be effected more rapidly than in polymerised resin-bonded paper. Specimens were dried by heating in an oven and were subsequently stored over a drying agent. Where they were exposed to controlled humidity this was done by enclosing them in chambers containing saturated solutions of suitable salts. The tests showed conclusively that the third harmonic voltage could act as an indicator of the presence and quantity of moisture and that the fundamental barrier theory seemed to be borne out.

The tests were then extended to the practical field and were applied to 6·6 kV current transformers which had been in store for a considerable time. These tests showed that moisture had been absorbed by the windings and further tests confirmed the findings. Tests were also carried out on 33 kV bushings and considerable success was achieved in identifying the presence of moisture even with the porcelain shell left *in situ*.

The harmonic level for any test voltage changes with temperature, but unexpectedly exhibits a minimum at 30° C. The reason for the rise in level above this temperature is probably due to the change in viscosity, but it is difficult to account for the phenomenon below this temperature.

The Report states in conclusion that the method has certain advantageous characteristics in that it is absolute, since the generation of any quantity of harmonic by the specimen under test is a positive indication of the presence of moisture or other defect. It is, however, emphasised that the results are dependent on temperature as well as moisture, and that in its present form the equipment is too bulky for use in the field. It is, however, thought that by choosing a test voltage of, say, 1 kV, field test equipment could be built which would be considerably lighter with a much quicker procedure.

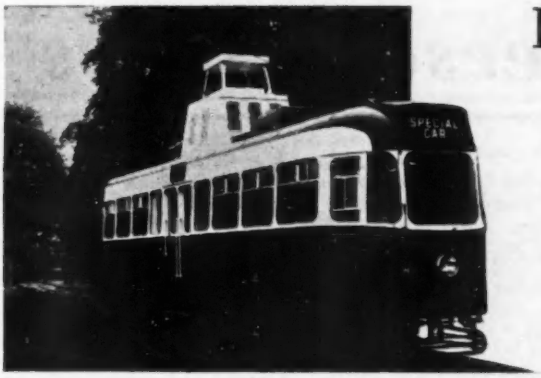
Future Possibilities

At present the test voltage has two distinct functions: it stresses the insulation and is also the agent by which non-linearity can be detected. If the functions were separated, much greater flexibility could be achieved. A further possibility is the location of the incipient fault or moisture location by means of some range-measuring technique. All possible methods appear to depend upon stressing the insulation by the service voltage at 50 c/s and using an r.f. pulse of smaller magnitude to locate either discharges or non-linearity. Such a procedure would be of great advantage in the testing of extended systems of insulation such as busbar systems.

FLAMEPROOF EQUIPMENT

The work which is currently being carried out at the E.R.A. on the subject of flange breadth in flameproof equipment in various explosive mixtures, is exemplified by two further reports in the series. The first, G/T 276, deals with "Flanged Joints, One Half-Inch in Radial Breadth in Mixtures of Ethylene and Air," and concludes that the most incendive internal mixture is 6·5%. The effect of the reduction in flange breadth from one inch to ½ inch is to reduce the maximum experimental safe gap from 0·028 in to 0·021 in (25% reduction), and the statistical maximum safe gap from 0·023 in. to 0·013 in, i.e. by 43%.

The second Report (G/T 277) deals with the same subject but using ethyl ether vapour and air. Results show that the most incendive internal mixture contains 4·0% ether vapour, although externally the figures are 3·0% for one in. flanges and 3·6% for ½ in. The reduction in flange breadth from one in. to ½ in. lessens the maximum experimental safe gap from 0·034 in. to 0·029 in. (15%), but the effect of the reduction on the statistical maximum safe gap cannot be quoted as data are not available to be assessed for the one-in. gap. The S.M.S.G. for ½ in. flange is, however, 0·029 in. Both these reports are available from the E.R.A., G/T 276 costing 7s. 6d. and G/T 277 10s. 6d.



High-speed Railcars in Leeds

New Suburban Service uses modern refinements

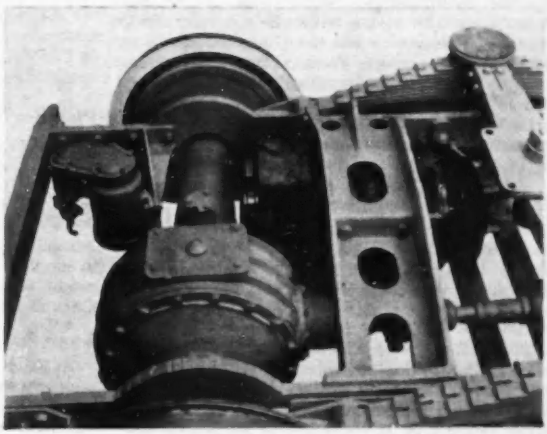
ALTHOUGH the orthodox tramcar no longer has a place in congested urban areas, high-speed railcars running on reserved tracks can still play an important part in public transport, particularly for suburban traffic.

At Leeds, therefore, a high-speed service using all modern refinements in tramcar design is to be introduced over special routes and on reserved tracks outside the city area.

The electrical traction equipment of these railcars is a further development of that already in service at Blackpool and includes "Vambac" (variable automatic multi-notch braking and accelerating control) gear; solenoid-operated internal expanding brakes mounted on the motor shaft; magnetic track brakes; bogie-mounted motors with cardan shaft drive, and resilient wheels.

The main feature of the "Vambac" control system is the accelerator which comprises a circular array of resistance winding and contacts which are operated in succession by a permanent magnet at the end of an arm which is driven round by a geared electric motor. This accelerator gives 83 steps of resistance switching and in consequence high ratio acceleration is permissible without jerkiness and consequent discomfort on the part of the passenger. The motor-driven arm is regulated in speed in accordance with the setting of the single driving lever, in conjunction with control imposed by automatic safeguards to prevent overloading. The same device controls braking, and in addition to rheostatic braking which operates down to 3-5 m.p.h. the railcar is fitted with solenoid-operated internally expanding brakes on the driving shafts of the motors. Magnetic track brakes are also installed for emergency stops. Both track and shaft brakes are operated from the battery. The control gear was manufactured by Allen West and Co. in collaboration with Crompton Parkinson.

Four motors are installed, each of 45 h.p., mounted rigidly on the bogies. The drive is via a cardan shaft to a spiral bevel reduction gearbox, and then through to the wheels. These are of the resilient type, introduced by Crompton Parkinson in which there is no metal-to-metal connection between wheel hub and tyre, torque being transmitted and shocks absorbed by large masses of rubber in shear.



In this view of the bogie are seen the reduction gearbox, resilient wheels and 45 h.p. motor

overseas news

Results from Toronto

After allocating $300,000 for frequency standardisation, $480,000 for voltage standardisation, and $950,000 for non-revenue producing improvements, the Toronto Hydro-Electric System reports a surplus of $14,141 for its operations in 1952. Several records were achieved by the undertaking in that year—the total number of units sold rose to over 2,142 million, while the number of consumers increased to 189,685. The system is overloaded by about 23,500 kW, the commissioners report, adding that capital expenditure of about $2,210,000 a year will be needed to provide the extra capacity. This increase in cost, which will have no corresponding increase in revenue, is partly to blame for the 15½% rise in hydro rates which took effect last February. The increased cost of power from the Hydro Electric Power Commission of Ontario is also blamed for the tariff rise. During 1952 about 24,000 ft. of duct, etc., was provided in the downtown area to be used when the removal of overhead wiring is resumed.

H.E. Tests

Trial runs are being made at the new 27,000 h.p. hydro-electric station on the Tobique River, New Brunswick. Designed and built by the Power Corporation of Canada, Ltd., at an estimated cost of $9 million, the plant will be operated by the government-owned New Brunswick Electric Power Commission.

St. John River Plan

Quebec Government experts are to study plans for the hydro-electric development of the St. John River with a view to possible co-operation with New Brunswick and the United States in a $250 million project, Premier Duplessis stated recently. The project has already been studied by the Joint International Commission. Quebec is being consulted, it seems, because projected dam erections will probably result in flooding of part of Temiscouata County in Quebec Province.

Ontario's Steam Plant

The fourth Parsons turbo-generator at the Toronto power station of the Hydro-Electric Power Commission of Ontario is now in full operation. This completes the installation so far authorised at this station, although there is a removable east wall which allows for future additions if and when necessary. Two of the four sets at the station are producing 100 MW at 60 c/s, while the other two units, using their two pole rotors, are providing 88 MW at 25 c/s. The latter two are to be converted to the higher frequency in due course. At the Commission's other steam station, the J. Clark Keith at Windsor, Ontario, the fourth and final English Electric set is scheduled to be in operation in November next.

Toronto's Subway

Toronto's new electric subway will not be in operation next February, as was originally planned, according to Mr. H. E. Pettett, secretary of the Toronto Transport Commission. He has stated that the manufacturers had been unable to deliver the new cars on schedule. It was hoped to have 104 cars delivered by the end of 1953, but it now seemed that 94 would arrive by next March which, according to Mr. Pettett, is the least number required to provide a minimum service on the new subway.

Take Over Suggestion

In Port-of-Spain recently, there have been suggestions that the Corporation electricity undertaking should be transferred to the Trinidad and Tobago Electricity Commission, who provide the bulk supply. There is no suggestion that the Corporation undertaking is not paying its way—in fact, each year's working usually results in a surplus of over $300,000—but the Corporation also operates a transport undertaking which has been suffering heavy losses. It is therefore suggested that the Corporation follow the example of the Central Government in surrendering most of its road transport to private enterprise. And if the electricity undertaking was handed over to the Commission, thus avoiding the division of responsibility for generation and distribution over an area so comparatively small as Trinidad, it might be in the best interests of the community, according to the suggestion.

Plan for Algeria

A plan for the construction of a thermal power station in Colomb-Bechar which will utilise coal from the neighbouring Kenadza mines, has been approved by the Industry Committee of the Algerian Assembly. The station is to be built primarily to supply a nitrogen plant and a synthetic aviation petrol factory which are to be established in Colomb-Bechar.

Loan for Escom

A local loan of £4,250,000 was offered for public subscription on behalf of the Electricity supply Commission of South Africa recently. The loan will mature in 1968/70. The money is to

be used to repay temporary borrowing for the construction of the new power stations, including Salt River No. 2, and for extensions.

Jordan-Syria Agreement

An agreement providing for a major irrigation and hydro-electric scheme on the Yarmouk River has been ratified by the Jordan Foreign Minister and Syrian Government representatives. (The river flows along the Jordan-Syria frontier.) Under the scheme the River Yarmouk will be utilised for irrigation and the generation of electric power for Jordan's resettlement scheme. Its cost is estimated at £18 million, and the necessary funds are being provided by the United Nations Relief and Works Agency, and from the British Government and the Jordan Treasury. A lake is to be formed in the Yarmuk area near the Syrian border, from which irrigation channels will run down the east and west sides of the River Jordan. Two power stations, one at the southern end of the Dead Sea, will be built.

Turkey Scheme

The Turkish Government has awarded a contract to the Morrison-Knudsen International Co. Inc., of the U.S.A., for the construction of a hydro-electric project in the Seyham River Valley in Southern Turkey. Under this scheme a large dam will form a reservoir with a capacity of nearly 5,000 million cu. ft. Over 360,000 acres of land will be irrigated. The power station will have two generators installed producing 284 million units annually, it is estimated. The financing of the Seyham project is unique in the country's history. Apart from a loan of over $25 million from the International Bank of Reconstruction, $12 million to be budgeted by the Turkish Government over the next three years, an additional 16 million liras (about $5,714,000) is to be provided by private Turkish individuals and companies.

State Boards Needed

A plea for the early formation of State Electricity Boards was made by Mr. Y. A. Fazalbhoy, presiding over the annual general meeting of the Electrical Contractors' Association in Bombay recently. He said it was regrettable that even the Government of Bombay had not yet decided to set up such a Board. He felt that its formation would materially assist in solving the States' power shortage. He also stressed the need for the formation of a non-official power committee to investigate the progress made by both the State and private enterprises in augmenting power generation in the State.

Price fixing in Orissa

A seven-man committee has been set up by the Orissa Government to examine the matters relating to the sale of electricity from the Hirakud scheme. Formed on the recommendation of the Hirakud Control Board, the committee is to fix the rates for power supplied to the various consumers. It will also ascertain the price of the 30 MW of power which will be Orissa's share from the Machkund hydro-electric scheme. The Hirakud project, when it is completed, will generate 200,000 kW, but the first stage, expected to be in operation in 1955, will provide 85,000 kW.

Railway Plan

The Calcutta Circular Railway Enquiry Committee, appointed by the Government last February in response to requests from West Bengal, has unanimously agreed that it is not advisable to run steam train services over the existing goods lines of the Port Commissioners' Railway. The Committee has accordingly recommended that an Electrified Circular Railway system, over a revised alignment of the Port Commissioners' Railway be surveyed. The Union Government's Railway Ministry are now engaged in an examination of the Committee's proposal and intend to link up these proposals with the scheme for electrification of the Calcutta Suburban Sections and the Eastern Railway main lines between Calcutta and the coalfields.

Increased Charges Inquiry

The Full Supreme Court of New South Wales has upheld Sydney County Council's appeal against the State Electricity Commission's increased charges for bulk supplies. The Court unanimously granted the Council's application for a writ of mandamus directing the Minister for Local Government, Mr. Renshaw, to submit the dispute to the Governor for settlement. Now the Governor-in-Council must decide if the increase is reasonable.

Brisbane's Expenditure

Of Brisbane City Council's £5,513,043 loan programme for 1953-54, over 53% has been allocated for electricity supply projects. This was revealed when the Lord Mayor, Ald. Roberts, recently presented the financial year's provisional estimates to the City Council recently. Altogether, some £2,942,159 is to be expended on electricity schemes, more than half being allocated for the new Tennyson power station—but £1,047,200 will be spent on distribution work.

No Take-over at Brisbane

The suggestion that the Brisbane City Council electricity undertaking should be taken over by the Southern Electricity Authority, of Queensland, to relieve the Council of arranging loan funds for the Department, was made by a member during the City Council's debate on the above estimates. But Ald. Coutts, chairman of the Council's Transport and Electricity Committee, has since stated that the Council would make no move in the matter. The Electricity Authority already had powers to acquire the undertaking, but he considers that such a move would result in a rise of 8½% in tariffs. He assumed the suggestion had been made so that loan funds granted to the Council could be utilised on other activities.

PERSONALITIES

IN THE INDUSTRY

The Harland Engineering Co., Ltd., announce that **Mr. G. S. Ramage,** secretary to the company since 1923, has been appointed to the board of directors.

Just nominated as joint managers of the Mullard Research Laboratories are **Mr. P. E. Trier,** M.A., and **Mr. G. Knott,** M.A., A.M.I.E.E. Mr. Trier is to direct the Electronics Laboratory and be responsible for work in the fields of communications, radar, special circuit techniques, ultrasonics, etc., and he will also act in the capacity of plant head. Mr. Trier graduated as a wrangler in the mathematical tripos at Cambridge, and was engaged at the Admiralty Signal and Radar Establishment from 1941 until 1950. During the war he developed d.f. techniques in the metric and centrimetric regions. Later, he was head of the V.H.F. communications group. He joined the Mullard Research Laboratories in 1950 as head of the

Mr. P. E. Trier

Mr. G. Knott

communications and radar division. Mr. Knott was a scholar at Clare College, Cambridge, and commenced his career as a physicist to the Calico Printers Association in 1935. From 1937 to 1940 he was engaged on research on X-ray crystallography at Cambridge University and afterwards he joined the Mullard Radio Valve Co. initially as development engineer on transmitting valves and later on v.h.f. valves. He was placed in charge of the Mullard Vacuum Physics Laboratory when it was formed in 1946. He will continue to direct the work of this laboratory in his new appointment, and will be responsible for v.h.f. valves, gas discharge tubes and photo-electric devices.

Dewrance and Co., Ltd., announce the appointment of **Mr. G. W. Dunk** as their sales and technical representative for Southern England, covering Oxfordshire, Buckinghamshire, Berkshire, Middlesex, Sussex, Surrey and Hampshire.

The 1953 scholarship, valued at £150 per annum for three or four years, has been awarded by the Brush Electrical Engineering Co., Ltd. to **Mr. D. N. Alcock,** a probationary apprentice, aged 18, who joined the company last August.

A long service certificate, commemorating 38 years in the Electricity Supply Industry, was last week presented to **Mr. G. T. Garwood,** M.Sc., M.Inst.C.E., M.I.E.E., sub-area manager of No. 3 sub-area of the South Western Electricity Board, by **Mr. S. F. Steward,** the board's chairman. Mr. Garwood started his career in the Industry in 1915, and after experience with the Plymouth and Kingston-upon-Thames undertakings, joined G. V. Twiss, the consulting engineer, and was responsible for supervising the whole of the original construction for the Electricity Distribution of North Wales Ltd. That experience held him in good stead when he became engineer and manager of the newly formed West Hampshire Electricity Co. in 1928, for that concern soon embarked upon an extensive rural electrification scheme using overhead lines. For his part in the improvement of o.h. line technique he was awarded the Sebastian de Ferranti Premium in 1946 by the I.E.E. As part of the presentation last week, Mr. Garwood received a new fly rod, reel and line, for he is a keen fisherman among other things.

At the annual convention of the Canadian Electrical Association, held at Murray Bay a few days ago, **Mr. C. I. Bacon,** vice-president and general manager of the Cornwall Street Railway Light and Power Co., of Cornwall, Ontario, was elected president of the Association.

Mr. H. Sulman has retired from the board of the Garrard Engineering and Manufacturing Co.

Mr. W. E. Lawton, president of the Association of Electrical Machinery Trades, who is chairman of the Industrial Electrical Co., Ltd., managing director of Meech-Lawton and Partners, Ltd., and also a director of other associated companies, has been elected to the Court of the Worshipful Company of Tin Plate Workers, one of the ancient livery companies of the city of London.

Mr. C. R. Plant has just taken up a new appointment as chief electrical engineer, Carbonisation Group, East Midlands Division of the National Coal Board. He is resident at the Avenue site, Chesterfield. Since 1937, Mr. Plant has been chief electrical engineer with Simon Carver Ltd., in the Coke Oven, By-Products and Coal Washery Division.

Mrs. Helen Key has taken up an appointment with the Pressed Steel Co., Ltd., as housecraft adviser. To many in the electrical industry she will be remembered as Miss Minoprio, who, in 1935, opened the London School of Electrical Domestic Science. During the war she worked on behalf of E.D.A., and afterwards she was for some years in Cologne. She is also author of a cookery book which is to be incorporated in a book on household management, soon to be published.

The appointment is announced of **Mr. W. A. Penkman** as manager of the service division of the Marconi International Marine Communication Co., Ltd. He has been with the concern since 1918.

Mr. R. G. Duncan, formerly of the technical sales staff of the Skefko Ball Bearing Co., has joined the sales staff of Lightalloys Ltd., for duties in connection with road and rail transport.

Styrene Products Ltd. announce that by agreement with Erinoid Ltd., **Mr. David R. Crabtree** has relinquished his position with the Sales Department of the latter company to become the technical service manager of Styrene Products Ltd.

OBITUARY

Mr. J. V. Chaplin, ASSOC.I.E.E., who was local manager at Colwyn Bay to the Merseyside and North Wales Electricity Board, died on July 10, aged 65. He was engineer and manager of the Colwyn Bay electricity undertaking from 1930 to 1948.

Sir Gerald Bruce, who became a part time member of the South Wales Electricity Board in 1951, died on July 7, aged 81.

Mr. H. P. Philpott, M.I.Mech.E., M.Inst.C.E., formerly Principal and Professor at Engineering College, Benares, India, died on July 7, aged 77.

Mr. Andrew S. Smart, a well-known member of the Dundee electrical trade, died recently. He had been in business on his own account at Victoria Road since 1941. A native of Dundee, he served his apprenticeship with Alexander R. MacKersie, of Bank Street. In 1919 he assisted in founding the business of R. Kilpatrick and Co., in Albert Square, and was with them for 16 years before going into partnership with Mr. D. Matthew and as Smart and Matthew, operated in Cowgate until 1941.

Mr. J. B. Browning. A.M.I.E.E., a specialist oil-filled cable engineer in the Engineering Division of British Insulated Callender's Cables Ltd., died on July 11, aged 49.

Mr. Walter Yates, M.I.Mech.E., chairman and governing director of Matthews and Yates Ltd., died on July 11, aged 88.

It is with deep regret that we record that death on July 12, of **Mr. Charles Pinkham,** who from 1927 until retiring in June 1950, was manager of the Publicity Organisation of the General Electric Co. Ltd. A man of immense enthusiasm and energy he made innumerable friends throughout the Industry. His drive and creativeness were responsible for the enormous development of the publicity organisation of the GEC into its present day pre-eminent position, and indeed to some extent, the status of the company itself. Charles, as he was affectionately known by his friends, was a welcome figure at electrical gatherings, for he was always effervescing with good nature. Educated at the Leys School and Caius College, Cambridge, where he took his M.A. degree, he was also prominent in many sports, particularly rugger, soccer and lacrosse for which he gained his blue. He also played soccer for England *v.* France. His association with the G.E.C. began in October 1913. On returning from the war in 1920, he became manager of the Stock Rooms. After 4 years he transferred to the Order Department as manager, and in 1927, he was appointed manager of the publicity organisation in which capacity he was responsible for the entire range of G.E.C. publicity. He had been a member of the Council of the Advertising Association for 14 years. A service is being held at St. James's, Weybridge, today, July 16, at 1.45 p.m. The cremation is private.

Mr. C. Pinkham

I.E.E. Council and Chairmen

THE Institution of Electrical Engineers has announced the constitution of the Council, the various sections, committees and the names of chairmen of the local centres for the session commencing September 30 next, as follows:

President: *H. Bishop*, C.B.E., B.Sc.(Eng.).

Vice-Presidents: *J. Eccles*, C.B.E., B.Sc.; *T. E. Goldup*; *S. E. Goodall*, M.Sc.(Eng.); *Sir George H. Nelson*; *W. G. Radley*, C.B.E., Ph.D.(Eng.).

Honorary Treasurer: *H. W. Grimmitt*.

Ordinary Members of Council: *C. Dannatt*, O.B.E., D.Sc.; *O. W. Humphreys*, B.Sc.; *Professor Willis Jackson*, D.Sc., D.Phil., F.R.S.; *J. O. Knowles*, M.A.; *G. S. C. Lucas*, O.B.E.; *B. L. Metcalf*, B.Sc. (Eng.); *J. L. Miller*, D.Eng., Ph.D.; *R. W. Mountain*, B.Sc.(Eng.); *A. H. Mumford*, O.B.E., B.Sc.(Eng.); *Professor M. G. Say*, Ph.D., M.Sc.; *D. P. Sayers*, B.Sc.; *R. L. Smith-Rose*, C.B.E., D.Sc., Ph.D.; *G. O. Watson*; *Professor F. C. Williams*, O.B.E., D.Sc., D.Phil., F.R.S.; *R. T. B. Wynn*, C.B.E., M.A.

Associate Members: *J. F. Bird*, M.C., T.D., B.Sc.; *A. T. Crawford*, B.Sc.; *H. R. L. Lamont*, Ph.D., M.A., B.Sc.; *G. Lyon*, M.Sc.(Eng.).

Companion: *C. R. King*.

Associate: *S. L. M. Barlow*.

Chairmen of Local Centres: *G. Caton* (North Midland); *T. Coates*, M.Eng., (Mersey and North Wales); *C. H. A. Collyns* (Scottish); *H. Esther*, B.Eng. (North-Eastern); *H. J. Gibson*, B.Sc. (South Midland); *J. Vaughan Harries* (Western) *J. R. W. Murland*, B.Sc. (Eng.) (Northern Ireland); *C. W. A. Priest*, B.Sc.(Eng.) (Southern); *H. West*, (North Western); *C. D. Wilkinson* (East Midland).

Sections: The Measurements Section Committee is constituted as follows: Chairman: *J. F. Coales*, O.B.E., M.A.; Vice-Chairman: *W. Bamford*, B.Sc.(Eng.); Members: *Messrs. T. S. Andrew*, *A. H. M. Arnold*, Ph.D., D.Eng., *W. Casson*, *C. G. Garton* and *Professor C. Holt Smith*, B.Sc.

The Radio Section Committee consists of:

Chairman: *J. A. Smale*, C.B.E., B.SC.; **Vice-Chairman:** *H. Stanesby*; **Members:** *Prof. H. E. M. Barlow*, PH.D., B.SC.(ENG.); *C. G. Macfarlane*, DR.-ING., B.SC.; *H. Page*, M.SC. and *R. C. G. Williams*, PHD., B.SC.(ENG.).

The Supply Section Committee is to be composed of: **Chairman:** *L. G. Brazier*, PH.D., B.SC.; **Vice-Chairman:** *P. J. Ryle*, B.SC.(ENG.); **Members:** Messrs. *A. R. Cooper*; *E. L. Davey*, B.SC.(ENG.); *D. T. Hollingsworth*; *H. M. Lacey*, B.SC.(ENG.) and *J. R. Mortlock*, PH.D., B.SC.(ENG.).

The Utilisation Section Committee will consist of: **Chairman:** *B. L. Metcalf*, B.SC.(ENG.); **Vice-Chairman:** *J. Hall*, B.SC.(ENG.); **Members:** Messrs. *S. English*, D.SC.; *H. C. Fox*; *F. P. Phillips*, B.SC.(ENG.) and *T. B. Rolls*, B.A. The Committee have co-opted Mr. A. H. McQueen to fill the casual vacancy created by the election of Mr. J. Hall as vice-chairman before the completion of his term of office as an Ordinary Member of Committee.

NEW LITERATURE

Electricity in the Garden

by Geoffrey Gerard

THE use of electricity in horticulture, particularly in the form of soil-heating and lighting, can lead to remarkable results in the production of crops and flowers. Unfortunately, the gardener himself is too often bewildered by technicalities and scared of electricity or alternatively plunges into the subject with consequent danger to himself. Now, an authoritative book is available on the subject which points out the advantages of electro-horticulture, yet at the same time explains the hazards, and emphasises the care that must be taken by the amateur. To this latter end, the author includes the Draft B.S. Code of Practice for Farm and Horticultural Electrical Installations, and has been at pains throughout to keep the accent on safety. The information on the horticultural side is comprehensive and easily understood. Published by W. H. and L. Collingridge Ltd., London, 125 pages, 5¼ in. by 8½ in. Price 15s.

Electrical Measurements, Part 2

by D. Karo, Dip. Eng., A.M.I.E.E.

THIS book, like the first-part has a three-fold aim. It is intended to cover the syllabus of the University of London's Engineering Science Degree in electrical measurements and measuring instruments, provide a laboratory manual giving proved measurement methods and finally indicate the means by which accurate measurements may be made. The field covered is a.c. measurements, that for d.c. having been dealt with in part one, and throughout the emphasis is on the calculation of error. Therein lies its chief value as a treatise on electrical measurements, but the extent and nature of the work is such to make it a useful addition to the student's bookshelf. From an introductory chapter on networks, this subject is considered more fully, discussing distributed constants and general characteristics of circuit elements. Later chapters cover a.c. bridges, from an intensive rather then extensive aspect together with a detailed inspection of the vibration galvanometer, headphones and c.r.o. Classical and original work on both Tuttle's measuring circuits and a.c. potentiometers complete the book. Published by Macdonald, 343 pages, 8½ in. by 5½ in. Price 30s.

Radio and Radar Technique

by A. T. Starr, M.A., PH.D., M.I.E.E.

IN a book of impressive size has been condensed the essentials, for the radio and electronics engineer, of his subject. Such an attempt has necessitated the exclusion of applications, methods and technique only being described. Mathematics, in a subject inherently mathematical, can assume almost terrifying proportions, but here it is confined mainly to appendices, treatment being largely, but not exclusively, from the physical aspect. Discussion ranges from an opening theme of communication methods to a more specific consideration of the electromagnetic medium. Emphasis is given to microwave techniques, in a detailed chapter on this subject. Aerials and valves each receive due attention, preceding a consideration of circuit techniques. These are considered for both continuous waves and waveforms. Appendices on subjects ranging from telegraph codes, through noise and parabolic reflectors to pulse amplifiers bring the book to a close. Published by Pitman, 812 pages, 9 in. by 6 in. Price 75s.

Power Transmission Engineering

edited by E. Molloy

THE eleventh book in the publisher's practical electrical engineering series is concerned with the grid transmission network, its transforming and switching stations and substations forming primary h.v. distribution centres. Designed to cater for the literary requirements of the practising engineer, the subject treatment places emphasis on plant, and line construction, layout, erection, testing and maintenance, each section being contributed by a specialist in the particular field under review. Attention is focused on overhead lines in the opening chapters, both construction and maintenances being considered, before turning to power cables. An instructive discourse on layout inspection and maintenance of substations thus leads logically to a review of high voltage switchgear. Switchgear maintenance receivers due attention, whilst the final chapter discusses protective relays. Published by Newnes, 180 pages, 9 in. by 6 in. Price 17s. 6d.

BOOKS RECEIVED

Symposium on Aluminium Alloy Castings. Full record of proceedings at this event which took place at Birmingham and London in November of last year. Published by the Aluminium Development Association, 33 Grosvenor Street, W.1, 224 pages, 8½ in. by 5½ in. Price 4s.

Principles of Alternating Current Machinery, by R. R. Lawrence, revised by H. E. Richards. Deals with more important types of machinery for senior students in electrical engineering. Published by McGraw-Hill, 623 pages, size 9 in. by 6 in. Price 60s.

Circuit Breaking, edited by H. Trencham, M.I.C.E., M.I.E.E. An account of research work given in a series of six lectures. Published by Butterworths, 206 pages, size 8½ in. by 5½ in. Price 30s. net.

Principles of Electronics, by H. Buckingham, PH.D., M.SC., A.M.I.E.E., and E. M. Price, M.SC.(TECH.). No. 9 in the publisher's electrical series, dealing with fundamentals, common electronic devices, and applications for power engineers. Published by Cleaver-Hume, 336 pages, 7½ in. by 4¾ in. Price 15s.

Case-Hardening Bar Stock

Continuous Process Provided by H.F. Induction Machine

THE latest addition to the range of high frequency induction heating machines manufactured by The General Electric Co., Ltd., is a bar stock hardening machine for the surface hardening of steel bars. It is designed for use with hardenable steels rather than with carburised bars, and can be adjusted to deal with sizes from ½ in. diameter to 1¼ in. diameter.

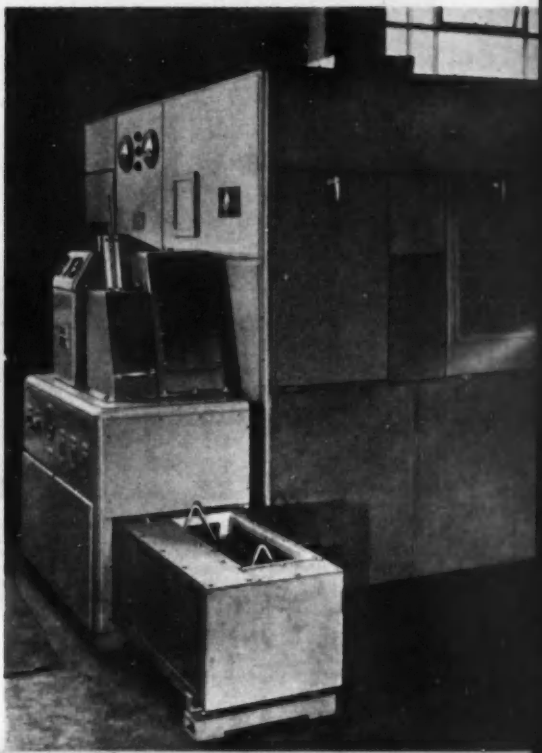
Operation is continuous, the bars being placed one at a time against the top of an inclined V-slide and allowed to pass down the slide and through the heating coil. The speed with which the bars pass through the heating coil is governed by two driven V-rollers, one situated above and one below the heating coil. Both rollers are geared together and driven by the same prime mover.

The heating coil puts all the available power into a very short axial length of skin, causing it to heat rapidly to hardening temperature. The thickness of the hardened case depends upon the speed with which the bars are caused to travel through the heating coil, but may conveniently be between 0·020 in. and 0·1 in. Great care has been taken to ensure a symmetrical case and uniform speed of drive.

On the far right is seen a general view of the hardening machine, whilst the close-up shows the operating head and heating coil

Immediately below the heating coil is the angular quench box through which the heated zone passes when it leaves the heating coil. As each treated bar is finished it slides down a chute and is collected in a basket at the bottom, as shown in the photograph below.

The machine, which is rated at 25 kW output, when treating 1-in. diameter bars at 30-in. per minute, gives a hardened case 0·025 in. thick.



BRITISH STANDARDS

Measurement of frequency variation in sound recording and reproduction. *B.S.* 1988 : 1953. *Price* 1*s. net.* In this memorandum is drawn attention to the lack of uniformity in both practice and terminology of measurement of undesired frequency variations in sound recording and reproduction. Recommended terms and definition are therefore made, together with general recommendations of criteria is to be observed during measurement of such frequency variations.

Wood poles for overhead lines (power and telecommunications lines). *B.S.* 1990 : 1953. *Price* 2*s.* 6*d. net.* Superseding B.S. 139 ("Red fire wood poles for telegraph and telephone lines") and B.S. 513 ("European larch poles for transmission lines"), this new standard covers pole sizes from 18 ft extra light poles to 85 ft stout poles. Emphasis is given to the importance of good preservation, achieved by pressure creosoting to ensure complete impregnation on seasoned timber after the completion of all fabrication. Appendices describe methods of determining moisture content and crippling loads of stayed and unstayed poles.

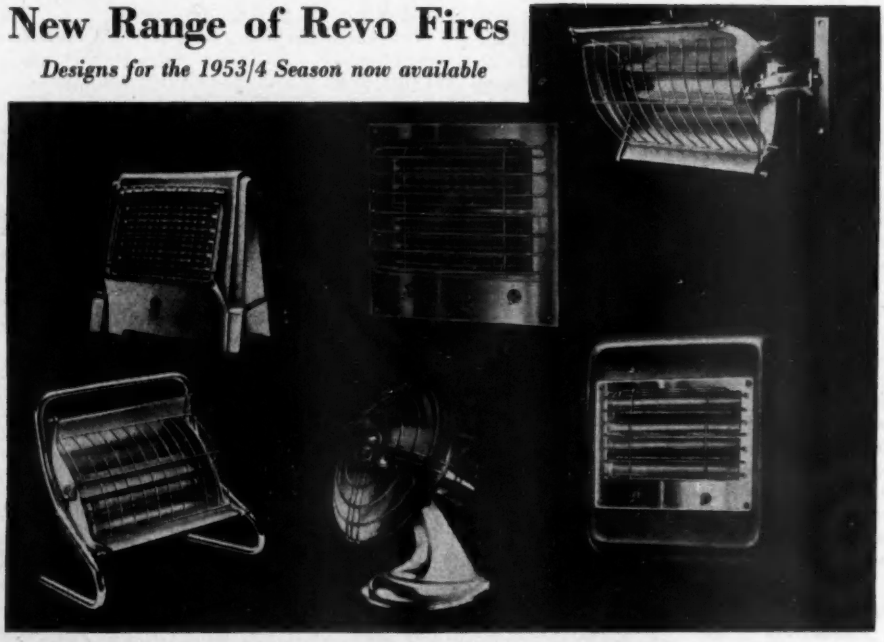
Solid drawn copper and copper alloy tubes for condensers, evaporators, heaters and coolers. *B.S.* 378: 1953. *Price* 2*s.* 6*d. net.* Superseding the 1941 edition, this revision of B.S. 378 refers to tubes in copper, copper-nickel, aluminium brass, and aluminium bronze (containing 7% Al), in addition to solid drawn 70/30 brass and 70/29/1 brass tubes covered in the earlier edition. Requirements for tubes for screwed glands have been omitted, and will appear in a separate standard.

British Standards Yearbook, 1953. *Price* 12*s.* 6*d.* With a comprehensive index to simplify reference, the 2,000 standards current at the end of March, 1953, are listed in this year's handbook, each provided with a brief description. Moreover, making its appearance for the first time is a list of those standards under which the B.S.I.'s certification trade marks are used. Particulars of work in hand are also given, together with details of membership of the Institution's committees and councils.

Copies of the above publications may be obtained from the British Standards Institution, 24 Victoria Street, S.W.1, at the prices stated.

New Range of Revo Fires

Designs for the 1953/4 Season now available

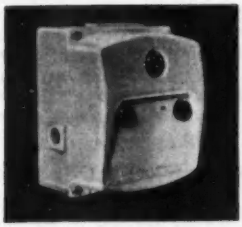


Shown above are new designs of fires which Revo Electric Co. Ltd. are to market for the coming season. Top, left is the Carlton 1 or 2 kW fire in vitreous enamelled beige. Top, centre, is the "Inset" fire, supplied complete with slabbing frame and available in 1 or 2 kW size in polished aluminium, with either rod or block type elements. Top, right, is the "Reflexam" fire, again 1 or 2 kW, for wall mounting, with chromium reflector and art. silver brackets. The "Tubula" (bottom, left) is all chromium plate in either 1 or 2 kW. The "Shirley," bottom, centre, is finished in bronze with copper reflector, with 600 W element, and the "Outset" model is identical with the "Inset," but is fitted with a bronze sheet-metal surround

The BUYER'S *Column*

B.T.H. Direct-on-line Contactor Starter

LATEST addition to the BRITISH THOMSON-HOUSTON CO. LTD. of Rugby's range of direct-on-line motor starters is Type DOC 71, which complies fully with BS 587 for "frequent duty" (40 starts per hour). It is suitable where starting current does not exceed eight times full-load value. All the ratings allow 25% sustained overload (BS 168).



The new B.T.H. unit

For use with single-phase or polyphase non-reversing squirrel-cage induction motors up to 5 h.p., 200/550 volts, 25/60 cycles, the starter is controlled by integral 'start-stop' push-buttons; provision is made for remote control.

A triple-pole contactor with auxiliary retaining switch is incorporated whilst silver-faced double-break contacts are used. The contactor opens under gravity, and provides inherent under-voltage protection.

Thermal overload relays provide protection to the motor under ordinary working conditions; resetting, after tripping on overload, is made by pressing the 'stop' button.

The starter is enclosed in a cast-aluminium box of attractive appearance and is normally arranged for wall-mounting. Starters are, however, available arranged for flange mounting.

"Bouncing Putty" is here

A BRITISH made silicone "Bouncing Putty" is now available in this country released by MIDLAND SILICONES, LTD., 19 Upper Brook Street, London, W.1.

It is a highly viscous rubber-like fluid readily shaped by kneading and elongated by pulling slowly. Highly resistant to sudden stresses, it breaks when pulled suddenly and shatters when subjected to sudden blows. It will, however, rebound when thrown or dropped onto a fixed surface.

It is partially soluble in most organic solvents and in water. Blue in colour the putty has been used in the U.S.A. as shock-absorbing padding for instruments in rocket research, vibration damping in piston-type dampers, weld backing compounds suitable for use in all arc welding processes except where Argon is used as a shielding gas and as transmitting mediums for ultra-sonic vibrations.

Lampshades in "Nylux"

THE use of high frequency welding in the fabrication of lampshades by KNIGHTSHADES, LTD., Derby Road Works, Montague Road, N.18, has eliminated the high cost of hand work which has affected the prices of lampshades.

"Nylux" is now available in a variety of finishes, the first pattern being the "Silk" finish. This is available with the addition of metallic gold polka dots.

Newer finishes are the "cretonne" style, both in texture and appearance; the "brocade" Nylux; and a "bamboo" Nylux which has the appearance of straw-coloured strands of thin bamboo. When illuminated this gives a soft orange glow.

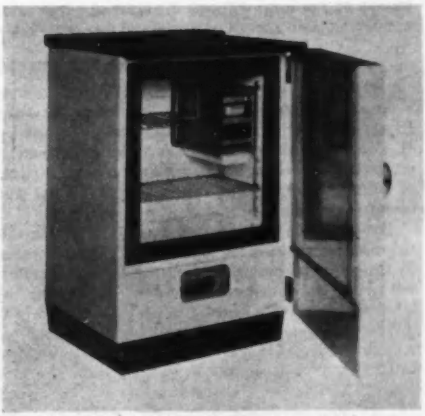
Perusal of the company's new season's list, No. 56, gives an idea of the greatly extended range of shades now available.

An absorption "frig" by Easiclene

THE latest addition to the range of domestic equipment supplied by EASICLENE PORCELAIN-ENAMEL (1938) LTD., Darlaston, Staffs, is the Easiclene 2 cu ft absorption type table top refrigerator which follows the 4½ cu ft silent unit introduced recently.

There are two colour schemes for the unit—either white with grey table top and white interior or cream with green table top and green interior. Plinth, edges, and surround are black in each case. The exterior is enamelled and the interior porcelain enamelled steel, whilst the multi-purpose table top is flat, stainproof, and burnproof plastic at the correct working height and providing 4 sq ft kitchen working space.

Two shelves are provided as is a drip tray in



The 2 cu. ft table top unit is available in two contrasting colour schemes

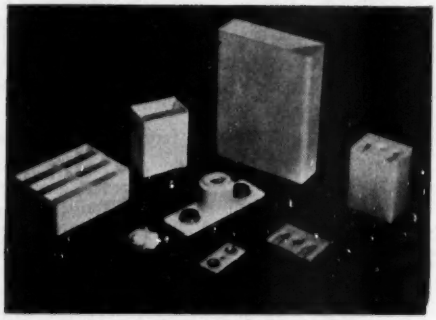
D

which wet fish and similar items may be kept and an ice tray for making 16 cubes of ice.

With the factory sealed refrigeration system guaranteed for five years and the cabinet for one year, the Easiclene 2 cu ft refrigerator is marketed at £67 10s. inc. purchase tax.

Mouldings in Polystyrene

IN our photograph is shown a selection of battery cell containers and ancillary components made from polystyrene co-polymer material, by UNIVERSAL METAL PRODUCTS LTD., Langley Road, Salford 6. Battery boxes have often to be made, due to restricted housing space, with relatively thin wall sections, and those illustrated have wall sections as thin as 3/64 in. However, being made from this tough resilient high



Some of the mouldings in co-polymer polystyrene

impact co-polymer material, they will withstand a good deal of rough handling which is not always the case with materials such as standard grade polystyrene or cellulose acetate.

On those mouldings where inserts have to be moulded in, the better elongation of this co-polymer material allows it to shrink round the inserts on cooling, without the crazing effect often appearing with standard grades of polystyrene.

Link type P.F. meter

ADDED to the range of link testing ammeters and wattmeters made by the GENERAL ELECTRIC CO. LTD., Magnet House, Kingsway, W.C.2, is a link testing power factor meter which, covered by British patent, follows closely the lines of existing G.E.C. link testing instruments and comprises a link unit and a plug-in indicator.

The link unit has a hinged pole piece to encircle the conductor into the handle plug leads similar to those in the company's ammeter which enable the voltage component to be connected by shrouded crocodile clips.

The indicator is the same size as the other instruments in the range and has two scales, one for circuits carrying 50-100 amps and the other for 100-250 amps. Both scales cover the range 0·5 lag—1—0·5 lead and the scale length is 2½ in. It is a true single phase p.f. meter of the moving iron type using split phase circuit and has three jack plugs connecting the link system. Standard ammeter indicator can be used in the p.f. links to provide an initial reading to determine which scale should be used.

The standard links are suitable for conductors up to 1⅞ in. dia, whilst a larger set is in production. An external resistance unit is available to enable the instrument to be used on circuits with line voltage up to 600 V.

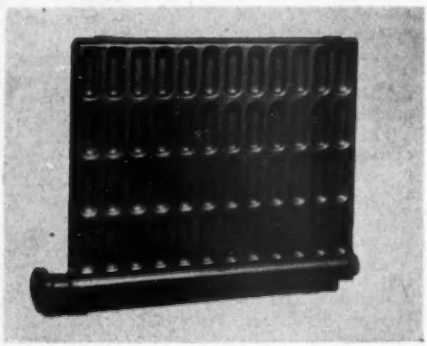
Cotton Insulating Tape

OUR attention has been drawn to the insulating Egyptian cotton sealed edge tape which is available from P. P. PAYNE AND SONS LTD., Hadyn Road, Nottingham, in a range of widths from 1¼ in. to 3 in., thickness ·006 in., made up 144 yds. per coil. Prices are keen, e.g., 10s. 3d. per coil of ½ in. tape. A cheaper material is ·01 in. thick and ½ in. wide only at 6s. 6d. per gross yards.

Dimplex Gas-tight Radiator

CONFRONTED with the problem of providing oil-filled radiators for use in hospital operating theatres where there is the likelihood of excesses of inflammable gases in the atmosphere DIMPLEX LTD., of Totton, near Southampton, Hants., carried out investigations into the problems of rendering the thermostatic control gas tight.

The many problems were finally overcome by attaching warning notices to the radiators and



Gas-tight Dimplex unit for operating theatres

filling a manual reset excess temperature cut-out within the gas-tight terminal head. This cut-out operates at approximately 230° F, some 40° in excess of the normal surface temperatures, and can only be reset by the removal of the cover-plate of the terminal head, which is secured by 4 special cup head-screws needing a special key.

These gas-tight radiators are meeting with success in many installations and are available in ½ kW-2 kW panel types or ½ kW-2 kW column types. Standard colouring is bronze but without extra charge they may be supplied to order in gold, cream, white, silver grey, sky blue, eau-de-nil and black.

ALUMINIUM MASTS

Lightweight Alloy Structure is easily transported and erected

WHEN carrying out tests to ensure the suitability or not of proposed v.h.f. links, pairs of temporary masts are required, one for transmission and one for reception. Structurally, these test masts must be easily transportable as sites can often be located in locations where access is difficult. Further requirements are that the height of the directional transmitting and receiving aerials and reflectors on the masts shall be readily adjustable, and that the erection shall be within the capacity of a small crew.

A pair of 200 ft high test masts to meet these requirements has recently been made for Standard Telecommunication Laboratories, Ltd., by Painter Bros., Ltd., Hereford, to the design of British Insulated Callenders Construction Co., Ltd. Each mast is of lattice construction, triangular in cross-section, and is built up from a number of short, easily-handled lengths. It is guyed at several points.

The material chosen for the structure was Noral 51 s.w.p., an aluminium-silicon-magnesium alloy supplied by the Northern Aluminium Co. This meets with the requirements of B.S. 1476 HE 10, and has a typical proof stress of 18 tons/sq in., and is sufficiently durable to be used without painting.

In practice, it is generally safe to say that aluminium, with a density one-third that of steel, will yield a structure of about one-half the weight of a steel one. Each length of mast, 8 ft 4 in. long, weighs only 110 lb and is easily handled by two men aloft with the aid of a light alloy erection pole.

Bolted construction has been chosen for the mast, so as to enable the individual lengths to be further broken down to any degree necessary for shipment over long distances. In general the bolts holding the sections together are of Noral 51 s.w.p. alloy, but the bolts that connect the lengths together are of high tensile steel. Mild steel is used for various details at butt joints and guying points, and all steel parts are galvanised to prevent atmospheric corrosion and to avoid the possibility of electro-chemical corrosion with the aluminium.

To help guide test equipment up and down the mast, a special section was designed for the main leg members to produce a rounded edge. This section was easily produced by using an extrusion process.

A central Coburn track is also provided on one face. All diagonal bracing members are $1\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{8}$ in., equal angles, and short horizontal pieces are fitted to act as steps.

Jointing the Lengths

At the butt joints, between the lengths of mast, the connections are made through welded steel fittings on each leg. These are made of $\frac{1}{4}$ in. steel plates, one shaped to fit inside the leg section and one outside. The plates are held on to the aluminium web by six $\frac{1}{2}$ in. dia. light alloy bolts. Only six $\frac{1}{2}$ in. h.t.s. bolts are required to connect the lengths.

One 200 ft mast, complete with steel head and base plates, wire ropes and fittings, weighs just over $1\frac{1}{2}$ tons. With all materials on site and the pickets driven in, the whole structure can be erected by six men in a day.

One of the test masts erected on site

The WEEK in NEWS

More Street Lighting in Autumn?

Discussions on Investment Limit taking place

THERE is every reason to believe that more street lighting projects will be allowed later this year. We understand that top level discussions are taking place within the Ministry of Transport to consider the practicability of raising the investment limit, imposed after the war to curb expenditure on street lighting and in numerous other fields. All street lighting schemes have to be approved by the Ministry who are bound to keep the total cost of all schemes in the country in any one year, within a limited sum. During the current financial year that sum will be at the same level as in 1952-53. (Actual figures on capital investment are not available.) When approached on whether or not discussions were taking place, the Ministry would neither confirm nor deny the fact, merely commenting that "nothing has been decided upon."

Any increase in the amount of capital released for street lighting will, of course, depend upon the Treasury, but added credence to the probability of an increase in street lighting may be found in recent events. Only a short time ago an additional £1½ million was made available for rural electrification, and only last week, Lord Leathers announced in the House of Lords that an extra £1 million would be allowed for road maintenance and improvements. Lord Leathers is Secretary of State for the Co-ordination of Transport, Fuel and Power, and both he and other members of the House expressed concern at the mounting road accident figures. Those concerned with street lighting maintain that improved lighting will at least help to prevent accidents, and few will argue against them. There is little doubt, therefore, that any increase in the number of schemes allowed will be welcomed wholeheartedly by local authorities, street lighting engineers and by those concerned with road safety.

Copper Trading from Next Month

DEALINGS in Copper will be resumed on the London Metal Exchange early next month, and in anticipation of this some details were given last week of the new trading contract which will apply. Unit involved is 25 tons. Standard delivery is electrolytic copper or high conductivity fire refined copper in wire bars of standard dimensions in weight range 200-275 lbs. Delivery can be made in cathodes not less than 99·9% purity or high-grade fire refined ingots or ingotbars of at least 99·98% purity at a discount of £3 a ton. Alternatively fire refined copper of not less than 99·7% purity may be delivered at £10 per ton discount.

DETAILS OF ZINC STOCKS DISPOSAL

DETAILED arrangements for the disposal of stocks of zinc remaining on August 1 have been completed by the Ministry of Materials, following discussions with the trade. In the Ministry's announcement last month (see our June 18 issue) it was stated that stocks would be about 70,000 tons, but it is now calculated that actual stocks at that date will be 64,000 tons. Provisional disposal plans were announced last December, and when those are completed zinc will be sold at a rate of 2,000 tons per month. This rate is to be compared with 4,000 tons a month plus sales by the Govt. Broker under present arrangements. The new rate is subject to review.

B.o.T. Dept. Moves

AS from Tuesday next the Industries Branch of the Board of Trade's Commercial Relations and Exports Dept. will be at Lacon House in Theobalds Rd., W.C.1. New telephone number will be Chancery 4411. At the same time the name of the department is to be altered to Export Services Branch, as this is considered a more appropriate title.

The First Half-Century

The Southport Sunday Trams question has taken rather an amusing turn. The party of intolerance called a ratepayers' meeting, and the good ladies of that persuasion assiduously canvassed the ratepayers who were ready to promise anything to free themselves from such embarrassing attentions. Consequently the ratepayers voted against Sunday trams, and a regulation was issued forbidding their plying for hire on Sunday. The B.E.T., however, was not to be beaten, the trams ran as usual, but not for hire within the Borough. Practically, the regulation made no appreciable difference in the receipts, for the bulk of Sunday traffic extends beyond the town limits, and the fare is the same for most passengers whether they have a free ride in Southport or no.—*From our issue of July* 16, 1903.

Advertising Electricity among Farmers

TWO events in different parts of the country have added significance when considered together. At Exeter last week the S. Western Electricity Consultative Council criticised alleged extravagances of the Board and particularly mentioned the Board's stand at the Devon County Agricultural Show. This was described as palatial and it was said to have been staffed by about 40 people despite the fact that few visitors seemed to call. A member said no private trader could have afforded such an exhibit, and when the Council considered the cost of electricity such matters had to be borne in mind. The chairman, Lady Carew Pole, rejected the allegations and said that in fact, the stand was well worth while and a great deal of business had been done.

Stands at Agricultural shows were also the subject of comment, although in a different vein, at a recent meeting of the E. Midlands Electricity Consultative Council. Hitherto, the Council was told, the Board had relied on those and similar shows to promote sales to farmers, but it was thought better that personal contact should be made and that the various types of farm installations which could be electrically driven should be pointed out to farmers. Accordingly the Board is to send out a team of salesmen to call on farms in an effort to increase electrification in agriculture.

Diamond Jubilee of Asbestos Company

THE steady and continuing progress of the Cape Asbestos Co. has never been such as to hit the headlines. In fact, during the whole of the past half-century one could almost compare the company with the Royal Navy, which is traditionally known as the silent service, but which is no less important or effective for that. It is thus a real pleasure to note that the company celebrates its diamond jubilee this year. To commemorate the occasion, Cape Asbestos have produced a most attractive book containing 85 pages of remarkable history. In words and pictures this book traces the story of the company from its early pioneering days in S. Africa in the 1890's to the present-day concern with its offices, factories, mines and associated companies in Europe and Africa.

FARMER COMPLAINS OF LACK OF PUBLICITY

LAST week a Lincolnshire farmer wrote to *The Times* criticising the Electricity Boards for not presenting their case for electricity to the farmer. He stated that, whereas he was inundated with all manner of advertising media from manufacturers, the Electricity Boards were strangely silent. E.D.A. has now replied to the criticism. They naturally express surprise, saying that information is readily available and point out that evidence of Boards' readiness to advise farmer-customers has been afforded by the electricity stand at almost every agricultural show. The Boards are also fully represented on the Association's Rural Electrification Advisory Committee, which is regularly engaged on the production of reports, leaflets, films, etc.

Paris Congress on Industrial Design

A THIRD International Congress of Industrial Design is to be held in Paris next September under the auspices of the French Institute of Industrial Design. General theme of the congress will be "Industrial Design: Attractiveness, Welfare and Source of Wealth," and in many cases discussions will probably be taken up where they left off at the two previous, and most successful, meetings at Darmstadt last year, and in London in 1951. We note that in the Industrial Section, discussions will include electricity, coal, gas and petroleum. Actual dates of the congress will be September 14 to 17, and it will take place at Maison de la Chimie in the rue St. Dominique.

Cooker Campaign

UNDER the slogan "New Electric Cookers save Money and Fuel," the Eastern Electricity Board is running an intensive campaign to boost cooker sales. Principal media has been the Press throughout the area, small posters, leaflets and folders. Particular emphasis is laid on hire purchase methods and main format comprises messages from satisfied housewives.

Film Strips for Electrical Students

EXTENDING the field of activities of their educational service, Mullard Ltd. introduced last week a series of filmstrips covering the last two years of the Ordinary National Certificate Course in Electrical Engineering. Twenty such filmstrips have been made, varying in length from 25 to 45 frames.

Produced by their Technical Publications Dept., with the advice and assistance from an Advisory Panel composed largely of Technical College teachers, these filmstrips are designed to augment the blackboard work of the lecturer. Their aim is two-fold, to illustrate principles and methods of construction and to introduce the student to practical applications of these principles.

For these purposes, the filmstrips are composed largely of graphs and diagrams which would involve laborious blackboard work, together with drawings and photographs of equipment and installations. Lecturers' notes are provided with each strip. It was pointed out by Mr. R. C. Winton, assistant to Mr. T. E. Goldup, a director of the company, when introducing a preview of the series, that these notes are in no way "potted" textbooks nor do they impose any preconceived method of exposition.

May's TV Sales were Highest ever

TO complete the picture of the demand for television sets just prior to the coronation, the R.T.R.A. issued last week their analysis of sales during May. Figures for April were reported in these pages last week. May was, however, the peak month and TV sales reached an all-time record of 18·74 sets per shop, an increase of 8·52 over April and nearly six times as many as were sold in the same month last year. Previous highest monthly figure was 15·62 in April 1951. The month under review also saw an increase in radio sales, average number sold per shop being 7·07 compared with 5·68 in the preceeding month and 5·11 in May 1952.

Birmingham's New Synchrotron

TESTS are now being carried out on the proton synchrotron at Birmingham University. Eventually it is hoped that the machine will speed up protons to about 90% of the speed of light, giving them an energy of about a million volts. This compares with about 10 million volts achieved by the university's cyclotron. In operation to date, energies of 250 million volts have been achieved.

The proton synchrotron is to be used for research in nuclear physics and particularly for laboratory reproduction of the processes of cosmic radiation. Construction began in 1946.

OFFICIAL PUBLICATIONS

BRITISH STANDARD
B.S.1990: Wood Poles for Overhead Lines (power and telecommunication lines); B.S.586: Photo-electric cells of Emission Type for Sound Film Apparatus.

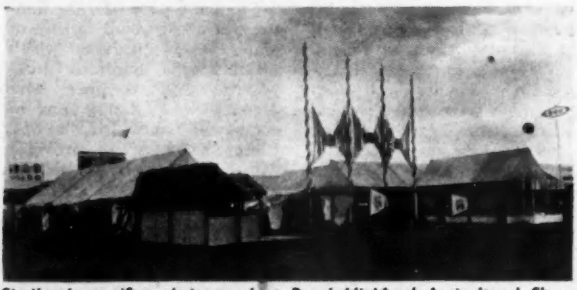
B.S. 1988. *Memorandum on measurement of frequency variation in sound recording and reproduction.*

ADVISORY COUNCIL ON SCIENTIFIC POLICY. *Sixth annual report for* 1952-53. H.M.S.O. 6d.

FINES FOR HIRE PURCHASE OFFENCES

FINES totalling £600 with 24 gns. costs have been imposed on George M. Brown Ltd., of Newcastle, in respect of hire-purchase and rental-agreement offences. The company pleaded guilty to four summonses of disposing of a vacuum cleaner and three radiograms on hire purchase by accepting less than a third deposit, and agreeing to receive the balance over a longer time than 18 months. There were similar pleas to four summonses for disposing of radiograms on hire-purchase agreement not wholly in writing. Prosecution stated that not only had the regulations been contravened as regards deposits and repayment, but it was found that agreements made after the new order became operative in February 1952, had been post-dated to the day before the order came into force.

The chairman, imposing the fines, said there had evidently been a deliberate attempt to deceive, and certain advantages must have been gained.



Similar in motif to their stand at Royal Highland Agricultural Show, reproduced last week, was E.D.A's display at the Royal Show, Blackpool This time, they had the co-operation of the N. Western Electricity Board

B.S.I. Conference on Cables

A COMMONWEALTH conference opened yesterday at the British Standards Institution. Its purpose is to discuss basic standards for electric cables, and delegates will comprise representatives of Australia, New Zealand, Canada, India, Ceylon, S. Rhodesia, S. Africa, Pakistan and, of course, the U.K. This conference arises from the fact that before the war, cables made to British Standards were accepted throughout the Commonwealth, except Canada where different voltages were employed, but there has been a tendency since 1945 for different standards to be published in the various countries concerned. There is no intention, it is understood, to urge that our Standards be accepted universally, but the object is merely to establish standards avoiding the multiplication of types for the same purpose.

Tech.College Expands

NEW extension to Poplar Technical College is being opened officially today by the chairman of the L.C.C. Education Committee, Mr. R. McKinnon Wood. The extension was started before the war, but had to be replanned and built again following the bombing. Accommodation is provided for a heat-treatment laboratory, a foundry, motor vehicle shop, electric and gas welding, together with an elementary engineering science laboratory, lecture rooms, drawing offices and an electrical installation room.

Golf Dates

E.I.B.A.'s 1953 National Golf Championship is now in full swing, and we have the dates of two of the Area competitions to take place later this month. On July 23, contestants in the S. Western Area are to play off their matches at the Royal North Devon Golf Club, Westward Ho, and the E. Midlands Area final is to take place at the Notts Golf Club, Hollinwell, nr. Mansfield, on July 28.

Strength is Feature of New Bollard

A SPECIAL roadside bollard has been designed and produced by Edison Swan Electric for use on dockside quays, marshalling yards and similar sites where they are apt to receive severe blows from goods being moved by crane, or like accidents. The frame has been built of standard steel angle section material to form an all-welded fabrication. The lamp compartment consists of a standard street-lighting type prismatic dome refractor, semi-permanently clamped on a gasket to the underside of the lid. The refractor's lower rim is pressed against a ring gasket cemented to the base of the lamp compartment. To provide adequate forward reflected diffused light, the inside of the rear panel and whole interior of the compartment have been finished stoved white enamel. The result is an exceptionally strong construction, comparable to anti-tank devices, but at the same time care has been taken to ensure that appropriate sections are readily accessible for cleaning and maintenance.

Upper portion of Edison Swan's new quayside bollard with the lid removed to show refractor and the lamp compartment

SHEFFIELD TRAMS BETTER THAN BUSES?

WHATEVER might be the position in other cities, the Sheffield Corporation Transport Department is working very satisfactorily—a net surplus of £74,532 resulted from operations during the year ended March 31 last. The department operates both tramways and motor buses. The 413 tramcars ran 11,841,470 car miles during the year, carried 151 million passengers and made a surplus of £44,525. The operation of the 590 buses resulted in a surplus of £30,007. Incidentally the car miles run by the tramways was about 600,000 less than in the previous year, and the number of units purchased were reduced correspondingly. Average traffic revenue per mile of the trams was 32·352d. and working expenses 28·617d. per mile.

Moffats Ltd. Purchased

MOFFATS LTD., one of Canada's oldest and largest appliance manufacturers, have completed negotiations for the purchase of its outstanding stock by the recently formed Avco of Canada Ltd., a subsidiary of Avco Manufacturing Corporation, of New York, we learn. Avco of Canada Ltd., we gather, is a marketing organisation which has a number of subsidiaries, including Bendix Home Appliances Canada, Ltd. From the British concern, Moffats Overseas Ltd., we are told that this move will not affect that firm's sales or export policy, and all purchasing of necessary materials will be continued as before.

TREASURY GUARANTEE

MAXIMUM limit of the Treasury guarantee to the B.E.A. for the third quarter of 1953 has been fixed at £35 million. This is in respect of short-term borrowings and compares with the £130 million for the second quarter. The large difference in these figures is due to the issue of a public loan of £125 million by the Authority last April.

Wiring Agreement between Board and Town Council

WHILST discussions on the wiring of new houses for electricity go on, it seems relevant to record an agreement reached between the Eastern Electricity Board and Tottenham Corporation. In all new housing schemes, the Council is to provide a minimum installation of one lighting point to each room, corridor and staircase, a 13A or 15A power point to each living room, kitchen and bedroom, and wiring from the meter to the refrigerator position and the hot-water cylinder. In addition wiring will also be provided from the meter to the cooker position with either a cooker panel or a 13A or 15A plug. In return the Board will seek no contribution toward capital costs of supplying electricity. The agreement is subject to confirmation by the Council.

New Signalling System for Newcastle

WE hear that the old style semaphore signals at Newcastle-on-Tyne's busy Central Station are to be replaced by modern multi-aspect electric signals. British Railways are to start on the four year replacement programme shortly. The four existing signal boxes at the station, will give way to one new electrically-operated box.

CABLE CONTRACT FROM THE U.S.S.R.?

ENFIELD CABLES LTD. may soon receive an order for the supply of cable to Russia. It is understood that the U.S.S.R. have been making inquiries with a view to placing a contract, and the Earl of Verulam, the company's chairman and managing director, left England for Moscow last week. Nothing was known of negotiations prior to his arrival back in London, which was after we had gone to Press.

Part of the much-publicised cross-Channel cable being supplied by British Insulated Callender's Cables Ltd. is shown here en route to Dover. The load illustrated comprises one of the two half-mile lengths of 132 kV gas-filled cable which will undergo sea trials off the coast before being returned to the works for tests

TRADE PACT WITH CHINA

NEWS from China last week included reports that an unofficial trade delegation had concluded a trade pact with the national import and export corporation there. Value of the contract was said to be about £15 million. The Agency reported that among goods which it had been agreed should be sold to China were electrical appliances, tools and instruments and communication equipment. The British Foreign Office denied knowledge of the agreement and added that the provision of export goods to Communist China would be subject to our export licensing. Early reports put the value of the pact at £30 million, but that figure included both British and Chinese consignments.

NEWS IN BRIEF

A new course and examination for stokers has been arranged by the City and Guilds of London Institute. The Ministry of Fuel, Coal Board, B.E.A., National Smoke Abatement Society and other bodies, have co-operated in setting the standard which will be nationally recognised.

Having considered the high standard of wages of employees at E. Yellend power station, Bideford Council have decided to charge rent of 38s. a week for council houses, it is reported from Devon.

Dr. A. G. Beverstock, education officer of Southern Electricity Board, addressed the National Association of Boys' Clubs' annual conference on Industrial Education last weekend.

Birmingham's last tram has made its final journey to the scrap yard.

S.E. Scotland Electricity Board are to ask for an allocation of £160,000 from the additional £1½ million granted for rural electrification.

Senior students of technical colleges and similar institutions are again invited by Wild-Barfield Electric Furnaces Ltd. during the winter months from October to May. Applications, giving alternative dates, should be made as early as possible.

An order for electrical equipment for the Steel Company of Wales Ltd., has been placed with the British Thomson-Houston Co. Equipment will include six d.c. motors totalling 18,850 h.p., two 8,000 kW motor generators and control gear.

Questions in Parliament . . .

Fuel Saving Appliances

Last year nearly two million solid fuel-saving appliances were delivered to the home market representing a six-fold increase in two years, and if that achievement was maintained for a further two years, half the homes in the country would have those appliances, Mr. G. Lloyd told the House. He had been asked what encouragement was being given to the introduction of the grates in view of the threatened coal shortage. Replying to other questions, the Minister said new standards of efficiency were brought into force on June 30 and if the appliance was appropriately installed the higher standard set was comparable with the 40% efficiency recommended by the Ridley Committee.

Railway Electrification

The Minister of Transport informed the House last week that the electrification of the Chingford line could not be undertaken until the new tube to improve distribution of traffic entering central London from Tottenham and Walthamstow had been completed.

Gileston Power Station

Mr. Pearson queried the proposal to build a power station at Gileston, Glam, and pointed out the detrimental effect such a construction would have on surrounding amenities. The Minister of Fuel and Power said he had heard of the proposal, but the B.E.A. had not yet applied for consent and he had no details of the suggested project at present.

Monopolies Bill

The Monopolies and Restrictive Practices Commission Bill was debated and read a second time in the House of Commons last Friday. In the main, the Bill was well received and welcomed as an advancement. It was, of course, inevitable that nationalised industries should figure in the discussion, but the subject was dealt with in the President of the Board of Trade's opening speech. He said the main reason for excluding State Monopolies from the Bill was that they were being considered by a Select Committee and it would be inappropriate to presume on their findings.

The matter, was, however, mentioned in subsequent speeches. Mr. R. Harris said many would be disappointed because of the exclusion, because there seemed to be no other organisation which could usefully investigate nationalised concerns. He reminded the House of a Conservative Party promise to bring the industries under the purview of the Commission. Much the same trend of thought was voiced by Mr. C. Fletcher-Cooke, who urgently called for an examination of nationalised industries. He instanced the subject of cables and their purchase by the Post Office. On a different theme Mr. W. T. Williams asserted that the Bill's main weakness was that it did nothing to strengthen the Commission in dealing with monopolies.

Monopolies Report on Copper

The Monopolies Commission have been asked to extend their investigation into manufactures of copper and copper-based alloys to the bearing the facts had on the public interest.

Grants to Technical Colleges

Mr. Pickthorn explained last week that all technical colleges could apply for grants for courses. So far applications from 11 had been accepted and a number of others were being considered.

N. of Scotland Board

Some details of installed capacity and finance of the N. of Scotland Hydro-Electric Board were given by Mr. J. Stuart in a written answer. Total installed capacity at July 1 was 397 MW he said. At the same date, capital expenditure incurred, including expenditure on assets transferred to Board on nationalisation, expenditure on works not yet operating, was £88·5 m. Issued capital was £82 m. and of that sum £57 m. of stock was issued to National Debt Commissioners and £27 m was public issue. In addition, Mr. Stuart continued, about £8.5 m. of compensation stock was issued to the public by B.E.A. in respect of assets vested in the Board, who will be issuing stock of the same value to the authority in due course.

The average load factor in 1952 was 27·7%. In the first six months of this year it was about the same. Load factor of demand was about 38%. He said he could not agree that the load factors of Moriston and Breadalbane scheme were relatively low as they will be about 43½% and 40%. Questions were asked by Mr. G. Nabarro.

Hire Purchase

Alleging that demand for radio and television sets was declining, Mr. Rankin asked last week whether they could now be excluded from the Hire Purchase and Credit Sales Agreements Order. Mr. H. Strauss replied that this was not possible.

Atmospheric Pollution

Mr. Marples said last week it was hoped to announce the names of the committee to investigate smoke pollution shortly. He did not answer Mr. Noel-Baker's query as to the installation of efficient solid fuel appliance which consumed all the fuel and prevented smoke.

Factory Inspectors

Recruitment of factory inspectors had improved greatly during the past year, Sir W. Monckton stated in a written answer on Thursday. He added that there were now very few vacancies.

Windmill Generation

The Minister of Fuel and Power has been asked by Mr. Neal whether he had any progress to report in experiments in the generation of electricity by windmill. In reply, he said that work was being carried out on two 100 kW windmills; one was in Orkney, and the other had just been completed in Wales for the B.E.A. The Ministry, he added, was collaborating with the B.E.A., the Hydro-Electric Board, and with E.R.A., and had recently bought for test a smaller windmill working on the Andrean principle.

V.H.F. Broadcasting

Mr. David Gammans again told the Commons that few plans could be made by the B.B.C. for very high frequency broadcasting until the form of modulation had been decided. Likewise the radio industry could not produce transmitters or special receivers necessary. The matter was before the Television Advisory Committee which expected to make its report in the autumn.

Purchase Tax Concession?

Purchase tax was again the subject of debate in the House last week. The particular aspect discussed was the problem of "uplift," a system whereby certain percentages are added to the price of goods when a retailer is supplied direct by a manufacturer. Mrs. B. Castle sought an immediate end to the system. In a short speech towards the close, the Chancellor said he was not overlooking the problems and was in fact collating the views of the trade. He did not feel he could make any decision on the evidence before him at present, but added that he hoped next year to come to a conclusion agreeable to the House as a whole.

Coal for Power Stations

In the course of numerous enquiries about coal stocks last Monday, Mr. G. Lloyd, said that stocks of small coal used by power stations remained large despite anxiety over house coal. He also stated that consideration was being given to the reintroduction of load-spreading in industry.

Electric Supply News . . .

Belfast

The total number of units sold in the Corporation's area of supply during the year ended March 31 last was 374·1 million, a decrease of 0·2% on the previous year. Trade recession was the main factor responsible for the reduced sales—the Transport Department and the shipyards each consumed over 2 million units less than in the previous year. Consumption for lighting alone showed an increase of 7·03% and domestic consumption generally was only 0·69% up. Additional consumers connected numbered 4,147, making a total of 130,942 at March 31 last. In connection with Stage II of the scheme for extending the 33 kV distribution system, contracts were placed during the year for switchgear, transformers and reactors. The contract for 33 kV is to be placed shortly. Mr. R. P. Watson, acting city electrical engineer and general manager, reports that work on the new power station is progressing satisfactorily. It appears reasonable to anticipate that the first 30 MW and two associated boilers will be in commission before the 1954-55 winter, he states. Finally, the year's operations resulted in a net surplus of £102,939.

Eire

As a result of further consultations with local people, the Minister for Industry and Commerce, Eire, has sanctioned the siting of the new turf-fired generating station at Deelis Bridge, 2½ miles north-east of Cahirciveen, County Kerry. The Electricity Supply Board has approved of the site. The site is convenient to extensive bogs; other sites have been surveyed with a similar object in view.

Lake District

Criticism of the North Western Electricity Board's policy of "non-cooperation" in regard to a supply of electricity to Borrowdale and Langdale, was expressed at last week's meeting of the Lake District National Park Planning Board. It was reported that the Electricity Board had said there was much rural work to be done, and it was therefore necessary to consider a programme which would take into account the essential needs of prospective consumers and the Board's capacity to carry out the work. In these circumstances, the Electricity Board added, priority must be given to those areas where electricity was required for farming purposes. It seemed that it would be a very long time before there was any prospect of its being able to proceed with work in Borrowdale and Langdale. The Park Board agreed to take up the matter with the B.E.A. and the National Parks Commission.

At the Penrith Rural Council meeting on the same day, Mr. J. E. Shepherd, sub-area manager to the N.W.E.B., revealed that the average cost of connecting a rural consumer in the Lake District National Park was £359, which compared with about a tenth of that sum for connecting an urban consumer. The cost per consumer, he added, of the recently installed supply in the valley of Martindale was £469.

Perthshire

Work is to begin this year on a new distribution scheme in East Perthshire by the North of Scotland Hydro-Electric Board. To provide a supply for the first time to about 600 potential consumers in isolated hamlets, farms and crofts, the scheme will cost about £300,000, and will be the forerunner of similar projects to be carried out as the labour and material position permits until the Board have covered the entire rural area. The area embraced—about 500 sq miles—is already largely served by electricity, but the intention is to fill in the gaps in out-of-the-way places. Guarantees will be asked, but at a rate of £3 per room per year, and for farmsteading £3 per 1,000 sq ft p.a.; they will not be related to the actual cost of supply.

Plymouth

It is expected that work will start in December next on the city council's new River Tavy scheme for increasing Plymouth's water resources. The proposals include the construction of a dam 100 yards long. A small amount of electricity will be generated by the water flowing down to Plymouth, and this will be sold to the South Western Electricity Board and will more than pay for any current that has to be purchased from the Board for pumping from Lopwell.

Worcestershire

The Worcestershire County Council is another local authority which is concerned at plans for the B.E.A.'s 275 kV grid. It has invited representatives of local authorities and other organisations concerned to meet in the very near future to discuss the proposals. There may be opposition to the proposed route, entering the county from Malksham at Ashton-under-Hill, skirting the east of Redditch and passing out at the Portway, on its way to Hams Hall. We have already noted other objections to the scheme.

LIGHTING SCHEMES

Bournemouth.—The Divisional Road Engineer has told the Highways and Works Committee that the street lighting investment has been increased and that a further consideration would be given to recommending a loan of £20,921. The Committee has approved application being made for that sum.

Ilford.—T.C. has been recommended to approve schemes for improved lighting in Burslem, Stoke and Newcastle Avenues, New North Road, and Green Lanes, etc. at a cost of £8,231.

Neston.—It is proposed to investigate the possibility of carrying out further improvements to the street lighting in certain areas.

Company Activities . . .

Alton and Co. Ltd.

This firm of pipework manufacturers and engineers is paying an Ordinary dividend of 10% on its £250,000 capital This compares with 5% on the £80,000 capital before the company was made public 18 months ago. The trading profit at £347,380 is £70,846 lower than for the previous year, but the net profit is £134,177 (*£137,363*).

Associated British Engineering Ltd.

A final dividend of 3% for 1952-53 is proposed, making 6% for the year, as against 17% for the previous period. The trading profit is £199,711 (*£250,794*), and the net profit, £88,320 (*£101,480*).

Keith Blackman Ltd.

The company has purchased additional manufacturing premises to which the sheet-metal section has been transferred, Mr. M. Burningham, the chairman, states. Competition has become much keener than it was last year, but in the directors' opinion this tendency will ultimately have the effect of bringing about a more realistic state of affairs than has been known for many years past.

Electric Construction Co. Ltd.

The increase in turnover in the year ended March 31 last, should be maintained during the current year, Mr. W. M. Furniss, the chairman and

Year to Mar 31	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	351,536	76,578	44	12½	57/-	45/-
1950	475,263	116,027	62	15	62/6	43/6
1951	506,816	100,680	54	15	72/-	55/-
1952	535,930	110,223	53	15	57/-	42/6
1953	552,526	109,316	44	15	56/-	52/-

managing director, states, for the new transformer shop, for which part of the new capital was raised, is now in production. A site for a factory has been purchased in South Africa, and to increase the sales of products in Canada, a company is now being formed with the title the Electric Construction Co. of England (Canadian) Ltd.

English Electric Co., Ltd.

Application lists will open and close today, July 16, in the offer, publicised on Monday, of £2½ million 4½% debenture stock 1972-77, at 97½ and of 1,759,365 £1 Ordinary shares which are to be offered to Ordinary stockholders at a price of 48s. 6d. each in the proportion of one new for every £3 of Ordinary stock held. For both, underwriting was arranged by Lazard Brothers. The new shares will not rank for the 5% interim dividend, just announced, but when fully paid will be converted into stock and will rank for any future Ordinary dividend. The combined net proceeds of the two issues will be about £6,600,000. This will reduce the company's bank indebtedness which at July 2 amounted to over £12 millions.

Marryat and Scott Holdings Ltd.

The financial year just completed was a record for this company both in the number of lifts built and in turnover. The number and value of lift maintenance contracts in hand has also increased.

Year to Dec.31	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1951	92,978	39,013	61	22½	6/7	5/-
1952	113,117	37,088	58	22½	5/10	5/1
1953	140,170	45,363	70	22½	5/10	5/1

Freehold premises have been acquired in Bristol, and extensions to the company's premises at Hatton Garden have been completed, bringing all departments there under one roof. Thus the property formerly occupied by certain departments has been disposed of at a substantial profit.

J. and F. Stone Lighting and Radio

It is proposed to make a bonus issue in the proportion of one new 5s. Ordinary stock unit for every two such units held. The board is also redeeming all the outstanding 6% Preference shares on January 31 next. At June 30, 1952, a total of 108,711 £1 shares out of £200,000 had been redeemed, leaving £91,289.

Ward and Goldstone Ltd.

The increased production during the year ended March 31 last is reflected in the trading figures. But conditions in the last few months have become

Year to Mar 31	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	283,975	52,150	94	50	48/-	35/9½
1950	363,581	141,607	214	44*	49/-	34/6
1951	477,643	188,547	298	45†	46/9	34/4
1952	511,624	185,115	267	45‡	32/6	27/-
1953	617,788	197,536	205	45	46/-	29/9

* Plus 25% capital bonus † Plus 10% capital bonus ‡ Plus 33⅓% capital bonus.

difficult, Mr. S. Goldstone, the chairman, reports. In certain sections of the home trade there has been a noticeable recession, while in overseas markets the company is encountering most severe Continental competition.

Warne, Wright and Rowland Ltd.

This group's subsidiary, W. T. French and Son Ltd., which it purchased 3 years ago, suffered from the general slump in domestic electrical appliances which today in this country are being mass-produced by all sorts of firms with little regard to available markets, according to Air-Commodore J. A. Cecil-Wright, the chairman. As one step in maintaining the company's position, certain electrical products are being developed.

Dividends Declared

English Electric Co.—Interim of 5% (*same*).

Telegraph Construction and Maintenance Co.—Interim of 3⅛% on increased capital.

Commercial Information

CONTRACTS OPEN

HOME

July 17.—Londonderry. Electrical installation at Ballykelly primary school extension. J. R. W. Murland, consulting engineer, 13 Wellington Place, Belfast. Deposit £2 2s.

July 18.—Lanark. Supply of 22 lanterns, leak transformers and capacitors for 140W sodium lighting along Lanark-Airdrie trunk road. Apply by above date to County Lighting Engineer, 15 Clydesdale Street, Hamilton.

July 18.—Prestwich T.C. Supply of equipment for conversion from tungsten filament to sodium vapour lighting along Heywood Rd. Borough Engineer, Town Hall.

July 18.—Whitefield (Lancs) U.D.C. Supply and erection of 73 Group A concrete columns with sodium lamps, lanterns and all auxiliaries, as well as dismantling existing equipment, along Manchester-Burnley (A.56) trunk road. Engineer and Surveyor, Town Hall. Deposit £2 2s.

July 20.—Barrowford (Lancs) U.D.C. Electrical work in erection of 18 houses on Higher Causeway estate. Engineer and Surveyor, Council Offices. Deposit £1 1s.

July 20.—Dover T.C. Supply and erection of 66 concrete columns and fixing only of H.P.M.V. units and auxiliary equipment, and complete wiring for Group A standard street lighting installation along Folkestone Rd. Borough Engineer, Brook House. Deposit £2 2s. (See July 2 issue.)

July 20.—Dundee T.C. Supply of poles, brackets and lanterns for Group B street lighting, and a battery for Morrison electric tower wagon. Public lighting Engineer, 46 Dens Rd.

July 20.—Leigh T.C. Installation of (a) 46 Class A mercury-vapour lighting points on 35 ft concrete columns, and (b) 25 Class A mercury and five fluorescent tube lighting points on 25 ft concrete columns. Borough Engineer and Surveyor, Town Hall.

July 20.—Southport T.C. Alteration and additions to electrical installation and lift at Fairholme, 8 Oxford Rd., Birkdale. Borough Architect, 93-105 Lord St. Deposit £1 1s.

July 21.—Bingley (Yorks) U.D.C. Rewiring of Town Hall. J. S. Laltin, Surveyor and Architect, Town Hall. Deposit £1 1s.

July 21.—Dublin. Electrical heating in Valuation Office, Ely Place. J. Tyrrell, secretary, Office of Public Works. Deposit £1.

July 21.—Southend T.C. Lighting and power installation in Leigh primary school. Borough Architect, 30 Alexandra St. Deposit £2. (See July 9 issue.)

July 21.—Waterford. Supply and erection of pumps and electric motors suitable for 380 V, 3-phase a.c. supply for Tramore water supply scheme. Engineer, Council's Offices, Davitt's Quay, Dungarvan. Deposit £1 1s.

July 22.—Co. Tyrone. Electrical installation at Denamona primary school, Fintona. Chief Education Officer, Educ. Offices, Omagh. Deposit £3 3s.

July 23.—Durham T.C. Supply and erection of 34 250 W mercury street lights along Sutton St. and Crossgate St. City Engineer, Town Hall. (See July 2 issue.)

July 24.—Breconshire. Quarterly inspection and servicing of electrically-operated apparatus (mainly motors and cookers) owned by County Council. Apply to Harley C. W. Strickland, County Architect, Rhyd Offices, Brecon.

July 24.—Dublin. Electric lighting, heating and other services at New Post Office, Monaghan. J. W. O'Neill, Engineer-in-Chief, Dept. of Posts and Telegraphs, The Castle.

July 24.—Heston and Isleworth T.C. Installation of Group A street lighting, including dismantling, erection of columns, lanterns and steel columns, and 400 W mercury lamps, along London-Bristol trunk road. Borough Engineer and Surveyor, 88 Lampton Rd., Hounslow. Deposit £2 2s. (See July 9 issue.)

July 24.—Lyme Regis T.C. Supply and erection of concrete columns, wall brackets and necessary fittings for improved street lighting scheme. Borough Surveyor, Borough Offices. Deposit £1 1s. (See July 9 issue.)

July 24. — Monaghan (Eire). Lighting, heating and other services at new post office. J. W. O'Neill, Engineer - in - Chief, Dept. of Posts and Telegraphs, The Castle, Dublin.

July 25.—Alnwick (Northumb.) R.D.C. Installation of electric light at Hillcrest, Shilbottle. O. M. Farrell, Engineer and Surveyor, Old Court Buildings, 34 Green Batt.

July 25.—Peterborough T.C. Lighting and power installations in 128 houses on Dogsthorpe North estate. Applications to F. J. Smith, City Engineer and Surveyor, Town Hall, by above date. Deposit £2 2s. (Advertised in this issue).

July 27.—Lancashire. Supply of electric lamps to county council. Applications to County Architect, County Hall, Preston, by above date. (Advertised in this issue.)

July 27 Sale T.C. Electrical installations in 24 bungalows on Baguley Lane estate. Borough Engineer, Town Hall. Deposit £2 2s.

July 27.—Southend-on-Sea. Lighting and power installation at Southchurch Hall school in Ambleside Drive. Borough Architect, 30 Alexandra St. Deposit £2. (Advertised in this issue.)

July 27.—Southwick U.D.C. Supply and erection of 27 sodium street lamps, 28 conversions from tungsten and sodium, and 74 tungsten lamps. Engineer and Surveyor, Town Hall. Deposit £2 2s.

July 27.—Stepney B.C. Electrical installation in 19 flats in Vallance Rd. scheme. Borough Engineer and Surveyor, 227-233 Commercial Rd., E.1. Deposit £2 2s.

July 27.—West Riding. Renewal of electrical installation at Dearne Thurnscoe The Hill secondary school. County Architect, Bishopgarth, Westfield Rd., Wakefield. Deposit £2 2s.

July 28.—Chadderton U.D.C. Erection of 31 group A street lighting columns in Coalshaw

Green Rd. and Drury Lane. Engineer and Surveyor, Town Hall. (Advertised in this issue.)

July 28.—Dundalk. Electrical installation at Fever Hospital. J. C. Costelloe, Consulting Engineer, 21 Lesson Park, Dublin. Deposit £10 10s.

July 29.—Ely (Camb) R.D.C. Electrical equipment for 6 bungalows in The Hithe, 29 houses in Woodfen Drove, and 6 bungalows in Victoria St. (all at Littleport), and 43 dwellings at Sutton and 6 houses at Thetford. Engineer and Surveyor, Council Offices, 11 Lynn Rd.

July 30.—East Riding. Installation of electricity at Leconfield primary school. County Architect, County Hall, Beverley.

July 31.—Belfast. Supply, erection, etc., of two 48-in. bore motor-operated sluice valves, six motor-operated penstocks and other associated equipment at Belfast Muncipal Power Station West. Tender form (No. N.1389) from Merz and McLellan, Carliol House, Newcastle-on-Tyne. Deposit £5 5s. (See July 2 issue.)

July 31.—Midlothian. Supply and erection of 77 concrete columns and installation of 80 W mercury lamps, etc., for Group B lighting at Newbattle New Community scheme. County Surveyor, 32 Palmeston Place, Edinburgh.

Aug. 1.—Ross and Cromarty. Installation of electric lighting and power in 22 houses on Isle of Lewis. Applications by above date to P. S. Leake, County Architect, The Old Academy, Dingwall.

Aug. 3.—Manchester T.C. Electrical installation at "Lawnhurst" in Wilmslow Rd. City Architect, Town Hall. Deposit £1 1s. (See July 9 issue.)

Aug. 6.—Belfast. Lighting installation in Currie jun. primary school extensions in Cosgrave St. Education Architect's Dept., Academy St.

Aug. 8.—Manchester. Electrical installation at Oldwood secondary school, Wythenshawe. City Architect, Town Hall. Deposit £1 1s.

Aug. 12.—Barrow T.C. Supply and erection of pumping plant, and gear. Borough Engineer and Surveyor, J. N. Flitcroft, Town Hall.

Aug. 19. — Newcastle-on-Tyne. Lighting, power and impulse clock installations at Stocksfield Ave. school. R. W. Gregory and Partners, consulting engineers, Pilgrim House. Deposit £5 5s.

Aug. 24.—Cheltenham T.C. Supply and erection of sodium street lighting equipment in Group A—including lanterns, lighting equipment, steel columns—for Bath-Lincoln trunk road. C. Gould Marsland, Borough Engineer, Municipal Offices. Deposit £3 3s. (Advertised in this issue.)

Aug. 26.—Baildon U.D.C. Supply, erection, etc., of 42 250 W MV lanterns on concrete columns in Baildon Rd. and Browgate. Surveyor, Town Hall.

Aug. 28.—Belfast. Supply, erection, etc., of 33/6·6 kV, 10,000 kVA, outdoor step-down transformer, with tap-change equipment. (Tender No. 1299.) Merz and McLellan, consulting engineers, Carliol House, Newcastle-on-Tyne. Deposit £5 5s. (Advertised in this issue.)

Aug. 31.—Thurrock U.D.C. Manufacture and installation of 3 axial-flow pumps, electrically driven and complete with switchgear, starters, travelling overhead crane, etc. for Marsh Farm Sewage works. W. H. Radford and Son, consulting engineers, Albion Chambers, King St., Nottingham.

No date stated.—Newcastle-on-Tyne. Supply of one 10-ton and three 6-ton electric travelling cranes for Newcastle Quay. Particulars from City Engineer, Town Hall.

Date unknown.—Middlesbrough T.C. Light and power installations in Kirby secondary grammar school. Education Architect.

OVERSEAS

*Details of items marked * may be obtained on application to the Board of Trade, Horseguards Avenue, S.W.1, quoting reference.*

Aug. 3.—India. Tenders invited for supply of (a) approx. 57 step-up and step-down power transformers from 5,000 kVA to 75 kVA and (b) about 155 11 kV indoor type switchgear, for the Electricity Dept., Govt. of Uttar Pradesh. Documents at Rs. 25 per set available from Project Officer, Hydel (Ganga) Circle, Electricity Dept., U.P., Roorkee.

Aug. 3.—New Zealand. Supply of e.h.t. cable, bare hard drawn cable, p.v.c. covered hard drawn aerial cable, and p.v.c. covered soft drawn binder wire, for Auckland Hydro-Electric Power Board. Total of 345,750 yd. required. B.o.T. (Ref.: CRE 22532/53)*.

Aug. 11.—U.S.A. Tenders invited for an a.c. water wheel generator, 6,250 kVA, 400 r.p.m., 2,400 V, with spare parts and auxiliary equipment for City of Centralia, Washington. Documents from Carey and Kramer, Consulting Engineers, 1917 First Ave., Seattle. Deposit $25.00.

Aug. 13.—New Zealand. Tenders invited by N.Z. Post Office (Pad T 150/6212) for 17 miles textile

Your Queries — Answered

"Fireball" fires, makers of? T.E.—James Smellie Ltd., Crator Works, Oxford St., Dudley. (23208)

"Percon" perspex fittings, makers of? B.C.—Hartley Electromotives Ltd., 1a Harrington Rd., S.W.7. (23217)

"Systym" irons, makers of? S.E.—Tym's Electric, Systym Works, Kennard Rd., Stratford, E.15. (23224)

"Marmet" kettles, makers of?—Genristo Ltd., Osmaston St., Nottingham, state that they can supply replacement elements. (23128)

"Spinney" irons, suppliers of? E.B.—Littlewoods Mail Order Stores Ltd., Kershaw Ave., Crosby, Liverpool 23. (23242)

"Acme" E.S. lampholders, makers of? W.W.—Engineering and Lighting Equipment Co., Ltd., Sphere Works, St. Albans, Herts. (23249)

"Erco" fans, makers of? B.C.—E.R. Company, Elliot Works, Elliot Rd., Bromley. (23256)

The above are selected from questions we have answered this week. If you have a query, send it to us.

ANSWER WANTED

"Hawkins," "Drake," copper well glass fittings, makers of? B.M. (23261)

Contracts Open—Overseas—contd.

covered pure lead sheathed telephone cable and 2½ miles E.S. and W.Q cable (2 oz. pairs 10 lb. conductors). B.o.T. (Ref.: CRE 22560/53)*.

Aug. 20.—Ecuador. Council of Latacunga invite tenders for supply of 2,000 h.p. hydro-electric plant, including pressure piping, two transformers and all other accessories. B.o.T. (Ref.: CRE 22988/53).*

Sept. 8.—Australia. Supply of control board for 33 kV switchgear, another for 11 kV switchgear and a third for mounting bus/bar protection equipment for ultimate 33 kV switchgear scheme. (Spec. no. 53/9.) Documents from Southern Electric Authority, Boundary St., Brisbane, at £2 2s. per two copies.

Oct. 27.—New Zealand. State Hydro-Electric Dept. invites tenders for manufacture, supply, etc., of two 3-phase 11 kV current limiting reactors, each 5,000 kVA through capacity, outdoor type, oil immersed and self-cooled, for Kaweran substation. Contract No. 237. Documents at N.Z. High Commissioner's Office, Adelphi Building, John Adam St., W.C.2.

Nov. 2.—Nigeria. Supply of materials and erection of about 85 miles of single-circuit o.h. lines to operate at 135 kV between Lagos and Ibadan, and about 55 miles to operate at 33 kV from Abeskuta to Sjebnode. Documents from Crown Agents for Colonies, 4 Millbank, London, S.W.1. Ref.: EM 725/4/2. Fee £10 for set of 3 copies. (Advertised in this issue.)

PRICE OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	252 0 0	—
LEAD, good soft pig (foreign) ...	90½-91	108 0 0
TIN (99-99.76%) ... ...(Cash)	595-597½	—
,, (3 months)	595-597½	—
ALUMINIUM, commercial purity (del.)	153 0 0	—
ZINC	72½-73½	88 0 0
ARMOURING:		
Galv. Steel Wire (0.104 in.) ...	53 10 0	—
Mild Steel Tape (0.04 in.)	40 0 0	—

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Bowser Bros., Ltd. Structural, mechanical, general and electrical engineers and contractors, etc. Cap.: £5,000. Dirs.: D. Bowser and H. G. Bowser, addresses not stated. Subs.: B. Diggines, 348 Station Rd., Knowle, Warwicks, and Hilda F. Grice, 259 Lichfield Rd., Four Oaks, Warwicks.

Carter and Finmore, Ltd., 48 Uxbridge Rd., Ealing, W.5. Manufacturers of and dealers in refrigerators and cold-storage plant, etc. Cap.: £10,000. Dirs.: P. Gibson and G. S. Lisle.

Deatron Electric Ltd., Kingsbury Works Estate, Kingsbury, N.W.9. General and mechanical engineers, manufacturers of machinery, electronic equipment and devices, etc. Cap.: £1,000. Dirs.: G. H. Dean and Edith Dean.

J. K. Ferris, Ltd., 14 Queen St., Blackpool. Electrical engineers and consultants, etc. Cap.: £3,000. Permt. dirs.: J. K. Ferris and Mrs. E. D. Ferris.

Gillingham Electric Co., (Dorset) Ltd., Jaclyn, Peasemarsh, Gillingham, Dorset. Manufacturers and dealers in electrical appliances, etc. Cap.: £2,500. Dirs.: J. T. R. E. Case and Mrs. L. M. Case.

Gravesend and Northfleet Floodlight Sports, Ltd., 11 Wrotham Rd., Gravesend, Kent. To undertake floodlighting of sports and other grounds and bldgs., etc. Cap.: £3,000. Dirs.: A. C. Norris-Telling, H. Morrison, A. E. Rothwell, F. Stevens, J. S. Rigg and J. Robbins.

T. B. Kirby Ltd. To take over business of radio, television and electrical engineers carried on as "Kirby Bros." at 37 Gorton St., Reddish, Stockport. Cap.: £5,000. Dirs.: T. B. Kirby and Mrs. L. M. Kirby.

Leach and Price, Ltd., 19 Hollingdean Rd., Brighton. General, mechanical, electrical and motor engineers, tool and jig makers, etc. Cap.: £100. Dirs.: J. J. Price and A. C. Liechti.

Preminco Ltd., 333a Station Rd., Harrow, Mdx. Mechanical, motor, electrical, oil fuel, constructional, marine and consulting engineers, etc. Cap.: £5,000. Dirs.: M. Scvik and R. H. Varcoe.

Rowland Priest, Ltd., Lower High St., Cradley Heath, Staffs. Manufacturers of and dealers in hydraulic, electric, pneumatic and other hoists, lifts, cranes, etc. Cap.: £80,000. Dirs.: B. Millward, and M. P. Millward.

Teleprojection Ltd., 159 Brent St., Hendon, N.W.4. Manufacturers of and dealers in wireless and television sets and electrical and mechanical, sound, and visual reproducing machines and accessories, etc. Cap.: £1,000. Dirs.: R. M. Francis, Kathleen Francis and D. C. Willis.

Town and Country Fittings Ltd., Menin Works, Bond Rd., Mitcham, Surrey. Manufacturers of and dealers in lighting fittings and lampshades, etc. Cap.: £100. Dirs.: H. C. Waite and K. Forster.

CONTRACTS PLACED

Chatham T.C. Provision of 25 street lamps in Capstone Rd., S.E. Electricity Board, £1,086.

Darlington T.C. Electrical work in 84 houses on Firth Moor estate. W. L. Clark, £1,960.

Farnworth (Lancs) T.C. Electrical installation in 189 houses on Plodder Lane South site, A. J. Dyer and Sons Ltd., £3,772.

Gateshead T.C. Electrical installation at Dryden Rd. grammar school. T. Mitchelson Electrical Ltd. £8,494.

Grimsby T.C. Electrical installation in erection of occupation centre at Nunsthorpe, L. Hancock, £1,114.

Hull T.C. Supply of switchboards. Telephone Manufacturing Co., Ltd., £4,638.

London. Electrical installation at Rotherhithe primary school (£2,841), Fullick and Loosely, Ltd.; same at Sellincourt primary school (£3,490), and renewal of installation at Central School of Arts and Crafts (£3,542), H. A. Lamb and Sons, Ltd.

Lowestoft. Electrical installation at Lowestoft and N. Suffolk Hospital, Eastern Electricity Board, £4,894.

Luton T.C. Electrical installation in houses on Westmorland Ave. estate, Scientific Electrical Services, Ltd., £3,314.

Manchester. Electrical installation in Ward 16 of Monsall Hospital, Engineering Services Co., £1,008.

BUSINESS PROSPECTS

HOME

Aberdeen T.C. It is proposed to build 3-storey blocks of flats, numbering 294, at Mastrick, and 24 at Ashgrove.

Bala (Merioneth) U.D.C. Construction of 38 houses at Hafan Bala. Council Offices, Bala.

Bishop Auckland. Plans in hand for erection of technical college in town. First stage will cover about 24,000 sq ft.

Borehamwood (Herts). Scheme in hand for major shopping centre comprising two 3-storey blocks with 6 large shops for multiple stores, branch post office, 31 other shops, 42 flats, etc. Estimated cost £222,000. A subsidiary shopping centre to cost about £30,000 also being planned.

Cardiff R.D.C. Erection of 36 and 18 dwellings at Pentyrch, S. P. Youldon, Engineer and Surveyor, Park House, 20 Park Place, Cardiff.

Carlisle. Approval received for erection of Harraby secondary school in 1955.

Coventry. Redgrave and Partners, 6 The Quadrant, Warwick Rd., are architects for construction of Y.W.C.A. hostel at the Butts.

Cricklade (Wilts) R.D.C. Ministry approval sought for erection of 70 houses.

Doncaster T.C. Construction of 109 houses, 12 shops and 18 flats on Cambley and Beckett Rd. estates.

Dorchester T.C. It is proposed to build 120 houses and 12 bungalows on Poundbury estate.

Durham T.C. Erection of shops on Sunderland Rd. estate. City Engineer is W. J. Green.

East Suffolk. Revised estimate of £138,666 approved for erection of grammar school at Stowmarket.

Farnworth (Lancs) T.C. Tenders may soon be invited for erection of 45 flats in Albert Road.

Fulham. Blocks of flats, one of which will be 9-storeys and another with shops are to be erected in Bulow Rd. Estimated cost £347,300.

Gravesend T.C. Branch library to be built at Woodlands Park.

Hull T.C. Construction approved of new central police station in Queen's Gardens. Estimated cost of first stage is £200,000.

Islington B.C. It is proposed to build £123,940 primary school in Hornsey Lane.

Jarrow-on-Tyne T.C. Scheme in hand for construction of maisonnettes off Ormonde St. at cost of £58,000.

Lambeth. Development of site in Hartington Rd. at estimated cost of £1,600,000 will include erection of flats in blocks of from four to 11 storeys and a number of shops.

Lincolnshire. Electricity will be installed soon in 19 village schools. Estimated cost £1,364.

London. It is proposed to include 11 more primary schools in list of those in which to replace gas by electric lighting. Total estimated expenditure £35,440.

Lytham St. Annes T.C. Fifty houses, 80 flats and 18 bungalows to be included in first development scheme of Smithy Lane and Blackpool Rd. site.

Malden (Essex) T.C. It is proposed to build 20 houses in St. Peters Ave. Further development of the site to include erection of 104 houses.

Middlesbrough T.C. Land is to be acquired in Merton Rd. for erection of further 440 houses.

Newbiggin (Northumb.) U.D.C. About 300 houses are to be built in new scheme at Newbiggin Moor.

Newcastle-on-Tyne T.C. Permission received to build primary schools on Montagu estate, at Fawdon and in Kenton Lane next year.

Nuneaton T.C. Layout plans prepared for 63 houses off Abbotsford Rd. Also, 190 houses to be built in Cedar Rd.

Oxford. F. W. Woolworth and Co., Ltd. has received permission to build multiple store with offices in Cornmarket Street.

Plymouth. Horne Bros., Ltd., of Oxford St., London, are to build premises in New George St. Architect is E. H. Davie, of Hillier, Parker, May and Rowden, 77 Grosvenor St., W.1.

Poplar B.C. Rider, Hunt and Partners, Bridge House, Queen Victoria St., E.C.4, are quantity surveyors for erection of 84 houses off Teriot Street.

Prestwick (Lancs) T.C. Construction of ten shops and 16 maisonettes on Carr Clough estate. Borough Engineer and Surveyor, Town Hall.

Ramsbottom U.D.C. Construction of 104 dwellings on Tagg Wood estate and 29 on Pin Meadow estate. Council's Engineer and Surveyor.

Romford (Essex) T.C. Revised plans prepared for erection of 40 flats on Firbank Rd. site. Also, it is proposed to build blocks of flats and houses on Bury Rd. site.

St. Andrews (Fife) T.C. Tenders to be invited for erection of 58 houses at Kiness Burn. Same number also to be built at Auld Burn site.

St. Helens T.C. Erection of 22 houses, 47 houses, and block of shops, houses and flats. M. Ward, Borough Engineer, Town Hall.

St. Ives (Hunts) R.D.C. Council is to build 30 houses at Fenstanton and 26 at Needingworth.

Sodbury R.D.C. Erection of 41 houses at Yates Aerodrome, 24 at Naishcombe Hill and 16 in Gorlands Rd. Surveyor, Council Offices, Chipping Sodbury.

Spalding U.D.C. Electricity to be provided for houses in district at estimated cost of £850. Also a new primary school is to be built in Queens Rd.

Stockton-on-Tees. Layout plans prepared for shops on Roseworth estate. Also scheme proposed for three-storey municipal building on cattle market site.

Wilton (Yorks). I.C.I. Ltd. are to double capacity of Terylene plant at cost of £10 million.

Ystradgynlais R.D.C. Construction of 40 houses on Abercrave site. Engineer and Surveyor, Council Offices.

OVERSEAS

Cuba. Agencies for U.K. manufacturers of small generating plants (not petrol), air-conditioning units, dry battery radio sets, and domestic appliances, being sought by General Abelardo Gomez Gomez of Aregna, Cia de Importacion y Exportacion S.A., San Rafael 826, Havana. Communicate direct.

U.S.A. W. W. Grainger Inc., 740 West Adams St., Chicago, wish to contact U.K. source of supply of repulsion induction motors. They are interested in 1 h.p., 1½ h.p., 2 h.p. and 3 h.p., 1,800 r.p.m., 115/20 V 60 c/s a.c. type.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Edmund Bassett and Son Ltd., manufacturers of electric light fittings. At first meeting of creditors Official Receiver reported that winding-up order was made on June 8. No statement of affairs had been filed but only known liabilities were amounts due to Mr. Bassett and a debt to Inland Revenue who obtained judgment for £180. There were no assets. No resolution was passed and matter was left in hands of Official Receiver as liquidator.

Cedarcraft Ltd. At meeting on June 30, resolution passed for voluntary winding-up. S. Kriteman, C.A., 1 Quality Court, Chancery Lane, W.C.2, was appointed liquidator, to whom creditors are asked to send particulars by July 27.

Dryall Ltd., electrical and general engineers. At first meeting of creditors Official Receiver reported that winding-up order made on June 8. No statement of affairs had been filed but gross liabilities were expected to amount to £1,068, of which £639 was directors loans, and £429 due to trade creditors. Assets were valued at £60. Resolution passed for appointment of Mr. A. G. White, C.A., of 73, Cheapside, E.C.2. as liquidator.

P. L. Dwyer & Co. Ltd., wholesale and retail suppliers of electrical goods. Liabilities of £950 against assets of £197 were mentioned at first meeting of creditors under a winding-up order made against the company on June 8. No resolution passed and matter was left in hands of Official Receiver as liquidator.

Chas. Jeremy (Electric) Ltd. Meeting of creditors will be taking place at 11.30 a.m. today (Thurs.) at Winchester House, Old Broad St., E.C.2, to nominate liquidator, and committee of inspection if necessary.

Midland Wireless and Electrical Appliance Co. Ltd. Meeting of creditors will take place at offices of Leeds Barlow and Co., C.A., 66 Alma St., Luton, on July 27 at 11 a.m. to receive statement of assets and liabilities.

Northern Rhodesia Power Corpn. Ltd. Resolution for voluntary winding-up passed at meeting on June 30. R. V. Pritchard, of 11 Old Jewry, E.C.2., has been appointed liquidator.

Universal Refrigerators Ltd. Resolution for voluntary winding-up passed at general meeting on June 19. C. R. Atkinson, 73-78 High Holborn, W.C.1, and C. Mannifield of 69 Cannon St., E.C.4, were appointed joint liquidators.

BANKRUPTCY ACTS

Receiving Order

Blackburn. Frank Lockett, trading as electrician at 10 Blackburn Rd., Gt. Harwood. Date of order, June 30. (Amended notice.)

Grimsby. A. Altman, electrical dealer of 230 and 232 Freeman St., Grimsby. Date of receiving order, July 1.

Grimsby. Joseph D. Stuart, electrician, of 22 Yarra Rd., Cleethorpes. Date of order, July 6.

Public Examination

Blackburn. Frank Lockett, electrician trading at 10 Blackburn Rd., Gt. Harwood. Public exam. at Court House, Victoria St., Blackburn, on Aug. 26 at 11 a.m. First meeting was on July 14.

Intended Dividends

Brentford. Lionel J. Quick, electrical distributor, trading at 2 The Mall, Ealing, W.5. Last day for receiving proofs, July 27. Trustee is R. A. Rodgers, 25 Bedford Row, W.C.1.

Edmonton. Gordon F. Jenkins, electrician, of 24 Browning Rd., Enfield, Middlx. Last day for receiving proofs, July 25. Trustee is W. J. Wallis-Hill, Official Receiver, 58-61 York Terr., Regent's Park, N.W.1.

TRADE NOTES

Holidays.—The Huddersfield office and works of Brook Motors Ltd. will be closed from August 8 to 15, and their Barnsley factory from August 22 to 29. The works of the Banner Electric Co., Ltd. will be closed from August 7 to Monday, August 24.

Israel Tariff.—Amendments have been made to the Israel Customs Tariff. Under this, the new duty on electric lamps, cooking apparatus, vacuum cleaners, kettles, food mixers, razors, refrigerators, washing machines, radios, is 50%, on lighting fittings 60%, and on meters 35% *ad valorem*.

Japanese Co.—Further to previous reports of the formation of a new joint company in Japan taking the place of Toyo Babcock K.K., the new company, Babcock Hitachi Kabushiki Kaisha, has been established with the following address: Tokiwabashi Office, 5 2-Chome, Ote-machi, Chiyoda-ku, Tokyo.

New Branch.—Bill Switchgear Ltd. have opened a new branch at 2 Lovell Road, Leeds, which is under the management of their representative, Mr. N. Sharples.

Telephone No.—British Insulated Callender's Cables Ltd. announce that the new telephone number of their Derby Depot is Derby 43697. The telephone number of their Southampton Branch Office has also been changed, to Southampton 76176-7.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller

Casonic. 714,909. Class 9. Piezo-electrical material made principally of ceramics for use as transducers. Plessey Co. Ltd., 56, Vicarage Lane, Ilford.

Corridolux. 717,290 and **Corrilux.** 717,291. Class 11. Lighting fittings and lighting installations. Simplex Electric Co. Ltd., Broadwell, Oldbury near Birmingham.

Duo-base. B715,562. Class 9. Electric switches, plug and socket connectors. Ashley Accessories Ltd., Morecambe Rd., Ulverston, Lancs.

"Extenso." 715,213. Class 9. Electric distribution boxes incorporating fuses. George H. Scholes and Co. Ltd., Wylex Works, Shorston Rd. Wythenshawe, Manchester.

MEETINGS TO NOTE

TUESDAY, SEPT. 15

A.P.L.E. Annual Conference and Exhibition at Liverpool continues until Sept. 18.

THURSDAY, SEPT. 24

I.E.E. Section summer visit to Porthcawl, Sept. 24 to 27.

EXHIBITION DIARY

Royal Welsh Agric. Show will be held at Cardiff between July 22 and 25.

Radio and Television. 20th show at Earls Court opens on Sept. 1 and closes on Sept. 12.

'PHONE YOUR NEAREST HENLEY BRANCH

V.I.R. cables from Stock

Henley Home Branches can supply from stock all the popular sizes and types of V.I.R. Cable. Prompt deliveries can also be given for colliery type cables and armoured shipwiring cables.

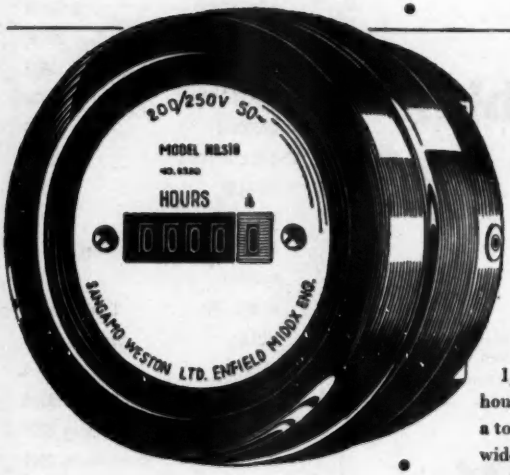
HENLEY CABLES

ABERDEEN	23630
BEDFORD	3568
BELFAST	25798
BIRMINGHAM	Central 3774-5
BRIGHTON	27133-4
BRISTOL	25730
BURNLEY	3682
CANTERBURY	3130
CARDIFF	20565
COLCHESTER	5604-5
DUBLIN	77271
DUNDEE	5719
EDINBURGH	Waverley 1464-5
EXETER	4753
GLASGOW	Central 1771
HULL	Central 36024
LEEDS	33431-2
LIVERPOOL	Royal 4137-8
LONDON	Chancery 6822
MANCHESTER	Blackfriars 7811
MIDDLESBOROUGH	43100
NEWCASTLE-ON-TYNE	21291-2
NORWICH	20994
NOTTINGHAM	47323-4
PLYMOUTH	5759
SHEFFIELD	24609
SOUTHAMPTON	3166

By appointment Electric Cable Manufacturers to the late King George VI

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD.
51-53 Hatton Garden, London, E.C.1

HOW MANY HOURS HAS YOUR EQUIPMENT BEEN OPERATING?



The Sangamo Model S.16. Hour-meter, with cyclometer type dial.

The Sangamo Model S.16 Hour-meter registers with infallible accuracy the number of hours during which an electrical circuit has been functioning. It is of the synchronous motor driven type, for use on controlled frequency supply. Normally supplied for 200/250v. 50 cycle mains, it can be ordered with cyclometer or pointer type dial and registers every 1/10th hour up to a total of 9,999·9 hours or, alternatively, every hour up to a total of 99,999 hours. The model S.16 is widely applied by *users* of important equipment to indicate that the time for a period overhaul has been reached—or by *suppliers* of such equipment to check the user's estimate of the number of hours which the plant will be in operation. Diameter 4½". Depth 3¾". Further details gladly supplied on request. Retail price in U.K. £5.3.3.

SANGAMO WESTON LIMITED

ENFIELD : MIDDLESEX

Tel: Enfield 3434 (6 Lines) & 1242 (4 lines) Grams: Sanwest, Enfield

Scottish Factory: Port Glasgow, Renfrewshire. Port Glasgow 4115

Branches: London, CHAncery 4971 Glasgow, Central 6208 Manchester, Central 7904 Newcastle-on-Tyne, Newcastle 26867 Leeds, Leeds 30867 Liverpool, Central 0230 Wolverhampton, Wolverhampton 21912 Nottingham, Nottingham 42403 Bristol, Bristol 21781 Southampton, Soton 3328 Brighton, Brighton 28497

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS | WORK WANTED WANTED · FOR SALE

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

CROWN AGENTS FOR THE COLONIES

TRANSMISSION SCHEME
FOR
ELECTRICITY CORPORATION OF NIGERIA

TENDERS are invited for the supply of all materials, with complete erection, on a schedule rate basis, of approximately 65 miles of single circuit overhead transmission lines to operate at 132 kV between Lagos and Ibadan, and approximately 55 miles to operate at 33 kV between Abeokuta and Ijebuode.

Tenders must be submitted in duplicate in accordance with the terms and conditions of the Specification reference EM.725/4/2 which may be obtained on application in writing to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, England, on payment of ten pounds for a set of three copies. Further single copies may be obtained on payment of five pounds per copy.

Payment must be made at the time of application and completed tenders are to be delivered to the Crown Agents for the Colonies at the above address, in a sealed envelope marked EM.725/4/2, by noon on Monday, November 2, 1953.

The Crown Agents for the Colonies do not bind themselves to accept the lowest or any tender, nor to assign any reason for the rejection of any tender, nor to purchase the whole of the plant and materials specified. (E 370)

CHADDERTON URBAN DISTRICT COUNCIL

STREET LIGHTING

TENDERS are invited for the erection of 31 Group "A" (25 ft. mounting height) Street Lighting Columns in Coalshaw Green Road and Drury Lane. Specifications and forms of tender may be obtained upon application to the Engineer and Surveyor, Town Hall, Chadderton. Tenders, enclosed in a plain sealed envelope endorsed "Street Lighting—Contract No. 11," must be delivered to the undersigned by July 28, 1953.

L. STOTT,
Clerk of the Council.

Town Hall,
Chadderton.
July, 1953. (E 394)

CITY OF BELFAST

OUTDOOR STEP-DOWN TRANSFORMER

TENDERS are invited for the supply, delivery and erection at Shankill Electricity Sub-Station, Belfast, of one 33/6·6 kV 10,000 kVA outdoor step-down transformer with tap-change equipment.

Form of tender (No. N.1299), conditions, specification and drawings, in quintuplicate, may be obtained from Messrs. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-upon-Tyne 1, on payment of a deposit of five guineas, which will be refunded provided a bona fide tender is lodged and not withdrawn. Extra copies of the contract documents may be obtained at one guinea per set; this sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each tender, in quadruplicate, in sealed envelope marked "Tender for 33/6·6 kV 10,000 kVA Step-down Transformer, Electricity Committee," and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4 p.m. on Friday, August 28, 1953.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast.
July 10, 1953. (E 395)

COUNTY BOROUGH OF SOUTHEND-ON-SEA

ELECTRICAL INSTALLATION

TENDERS are invited for the new Electric Lighting and Power Installation at Southchurch Hall High School, Ambleside Drive, Southend-on-Sea.

General conditions may be inspected and copies of plans, form of tender, and specification obtained on and after Friday, July 10, 1953, on application to the Borough Architect, 30 Alexandra Street, Southend-on-Sea, on payment of a deposit of £2, which sum will be refunded on receipt of a bona fide tender or the return of all loaned documents.

Sealed tenders addressed to the undersigned and endorsed "Electrical Installation, Southchurch Hall High School," are to be delivered to this office before 12 noon on Monday, July 27, 1953.

No tender will be received except in the special envelope provided, which shall not bear any name or mark indicating the sender.

The Corporation do not bind themselves to accept the lowest or any tender.

ARCHIBALD GLEN,
Town Clerk.
(E 369)

BOROUGH OF CHELTENHAM

TRUNK ROAD LIGHTING: BATH-LINCOLN TRUNK ROAD

TENDERS are invited for the supply and erection of sodium discharge street lighting equipment to 128 lighting points to Class "A" standard as follows:—

Bill No. 1: For the supply only of lanterns and lighting equipment.

Bill No. 2: For the supply and erection of some 140 tubular steel columns and the fixing of lighting equipment.

Specification, bills of quantities and form of tender can be obtained from the undersigned on payment of a deposit of three guineas, which will be refunded on receipt of a bona-fide tender, not subsequently withdrawn, and the return of all documents.

Drawings and conditions of contract may be inspected at this office during the usual office hours.

Tenders, together with fully priced bills of quantities, submitted in the envelope provided, are to be in the hands of the Town Clerk, Municipal Offices, Cheltenham, not later than first post, Monday, August 24, 1953.

The Council reserves the right to treat each bill of quantities as a separate tender and does not bind itself to accept the lowest or any tender.

G. GOULD MARSLAND, M.B.E.,
Borough Engineer.

Municipal Offices,
Cheltenham.
July 11, 1953. (E 414)

CITY OF PETERBOROUGH

THE Council invites tenders, from recognised electrical contractors, for the electric lighting and power installations to 128 permanent houses on the Dogsthorpe North Estate, Peterborough. The houses will be in two groups: Group "A" 62 houses, and Group "B" 66 houses.

Drawings, specifications and forms of tender may be obtained on application to F. J. Smith, M.B.E., A.M.I.C.E., City Engineer and Surveyor, Town Hall, Peterborough.

Applications, before noon on Saturday, July 25, 1953, should be accompanied by a cheque for £2 2s. made payable to the Peterborough City Council. This will be returned on receipt of a bona fide tender or the return of the documents.

The Council does not bind itself to accept the lowest or any tender.

C. PETER CLARKE,
Town Clerk.

Town Hall,
Peterborough.
July, 1953. (E 384)

LANCASHIRE COUNTY COUNCIL

APPLICATIONS are invited for the supply of ELECTRIC LAMPS to the Lancashire County Council. The successful firm will be required to deliver direct to all county premises in both small and large quantities.

Firms desiring to tender should make application to the County Architect, County Hall, Preston, not later than July 27, 1953. (E 368)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following positions within the Division:—

CIVIL ENGINEERING DRAUGHTSMEN
Construction Department (Vacancy No. 22/53)

Candidates should have experience in design and detail of reinforced concrete structures, piled and slab foundations for heavy plant, culverts, cable subways, etc., for general building construction, drainage and sanitation schemes, associated with office and administrative buildings.

The salary will be in accordance with Grade 5 (£567 to £671 per annum), or Grade 6 (£433 to £567 per annum) of Schedule "D" of the National Joint Board Agreement.

ENGINEERING DRAUGHTSMEN (Mechanical)
Construction Department (Vacancy No. 44/53)

Senior Draughtsmen are required in the Mechanical section of the Construction Department at North Wilford Power Station. Candidates should have experience in one or more of the following:—

(i) Design and layout of power station equipment, including turbo-alternators, boiler plant, coal and ash plant, and general station auxiliaries.
(ii) H.P. and L.P. steam and feed pipework, condensing plant and feed heating systems.
(iii) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

Salary and conditions of service will be in accordance with the National Joint Board Agreement, Grade 5 (£567 to £671 per annum), and Grade 6 (£433 to £567 per annum) of Schedule "D," according to experience.

ENGINEERING DRAUGHTSMEN (Electrical)
Construction Department (Vacancy No. 61/53)

Candidates should have experience in the preparation of layouts and diagrams for the installation of e.h.t. and l.t. switchgear, transformers, e.h.t. and l.t. cables; knowledge of protective gear systems would be an advantage.

The salary will be in accordance with Grade 5 (£567 to £671 per annum), or Grade 6 (£433 to £567 per annum) of Schedule "D," of the National Joint Board Agreement.

JUNIOR ENGINEER
Coventry Power Station. (Vacancy No. 73/53)

Applicants should have had technical training and preferably experience in a power station.

Salary and conditions will be in accordance with Class "G," Grade 14, £491 per annum.

Closing date for this appointment, July 28, 1953.

The above appointments will be superannuable within the provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form, which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned to the Divisional Controller. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.
(E 367)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SERVICE CENTRE SUPERVISOR required in the Liverpool Central District of No. 1 Sub-Area. Salary £640 to £700 per annum. (N.J.C. Grade 5.) The appointment is superannuable and subject to medical examination.

Candidates should have experience in sales, display and the management of Electricity Service Centres.

Forms of application obtainable from the Manager, No. 1 Sub-Area, 24 Hatton Garden, Liverpool 3.

Closing date, July 30, 1953. (E 369)

YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

No. 3 (Sheffield) Sub-Area

GENERAL ASSISTANT ENGINEER
(Operational Control)

Applicants should have technical qualifications preferably to Higher National Certificate standard, and must have had operational experience on a large electricity supply system.

The successful candidate will be expected to take charge of the Sub-Area Control Room during his shift, working on a five-man shift rota. During this period of duty he will be expec ed to carry out emergency operational switching on the heavy industrial part of the system in the vicinity of the control room. His duties will include the control of all switching carried out by other engineers in the Sub-Area during his period of duty.

Salary: N.J.B. Class "N," Grade 13, £692 to £716 per annum.

Applications, giving full details of age, qualifications and experience, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than July 30, 1953.

No. 5 (Wakefield) Sub-Area

Castleford District.
GENERAL ASSISTANT DISTRICT ENGINEER
(two posts)

Applicants should preferably be Graduate Members of the Institution of Electrical Engineers and have experience in the construction, operation and maintenance of overhead and underground distribution systems.

Applicants should be prepared to reside in the district and undertake standby duties.

Salary: N.J.B. Class "E," Grade 11, £524 to £550 per annum.

Applications, giving full details of age, qualifications and experience, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Road, Wakefield, not later than July 30, 1953.

No. 6 (Hull) Sub-Area

THIRD ASSISTANT ENGINEER (CONSTRUCTION)

Applicants should have had experience in planning, estimating and construction of h.v. overhead lines up to and including 66 kV.

Candidates who should possess the Higher National Certificate in Electrical Engineering, will be required to reside in the vicinity of Driffield and to carry out standby duties.

Salary: N.J.B. Class "J," Grade 10, £680 to £706 per annum.

Applications, giving full details of age, qualifications and experience, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than July 30, 1953. (E 386)

SIGNALS ASSISTANT INSPECTORS OF POLICE

(Supernumerary)

REQUIRED by the GOVERNMENT OF KENYA for one tour of two years with possible extension. Commencing salary, etc., according to previous experience, in scale £767 rising to £1,092 a year. Gratuity (at least £162 after two years' service) payable on satisfactory final completion of service. Outfit allowance £30. Uniform allowance £10 a year. Free passages. Liberal leave on full salary. Candidates aged 20-30 should be at least 5 ft. 7 in. without footwear, have normal vision without glasses and be of good education. They should possess a sound knowledge of the installation and maintenance of modern low and medium-powered V.H.F. static and mobile equipment, H/F transmitters and receivers, petrol generators and diesel electrical sets. Candidates with previous United Kingdom or Colonial Police experience will be considered up to 35 years of age.

Apply in writing to the Crown Agents, 4, Millbank, London, S.W.1, stating age, name in block letters, whether married or single, full qualifications and experience and quote M1/32820/EE. (E 359)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

ASSISTANT SHIFT CHARGE ENGINEER is required at Stourport "A" and "B" Generating Stations. N.J.B. service conditions, superannuable appointment, salary within Schedule "A," Grade J9, commencing at £719.

Higher National Certificate in electrical and/or mechanical engineering required together with sound technical training and practical experience in the operation of a modern high pressure, high temperature generating station. A knowledge of pulverised fuel firing will be an advantage.

Apply on forms available from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, or on Form AE6, by July 25, 1953. (E 339)

NORTH WESTERN ELECTRICITY BOARD

SENIOR SALES REPRESENTATIVE
required in the West District, Stretford

DUTIES include advising consumers (either at District Office or at the consumers' premises) on all matters normally concerned with sales development, i.e. tariff queries and apparatus sales for domestic and small commercial and industrial applications.

The successful applicant, if not already qualified, will be expected to undertake approved training courses.

Salary scale: £460 to £520 p.a. Grade 2, N.J.C. conditions.

Applications to Sub-Area Secretary, The North Western Electricity Board, Town Hall Extension, Manchester, P.O. Box 493, by July 25, 1953.

APPOINTMENT OF GENERAL ASSISTANT ENGINEER
No. 2 Sub-Area Testing Station, Walkden

Applicants should be experienced in laboratory testing of all types of polyphase metering equipments and laboratory and site testing of protective gear. Experience in testing and installation of industrial metering equipments will be an advantage. Technical education up to H.N.C standard is essential.

Salary scale: £616 to £946 p.a. Grade "L.13," N.J.B. conditions.

APPOINTMENT OF GENERAL ASSISTANT ENGINEER
(Installation Contracts)
Sub-Area Commercial Department, Bolton

Applicants should have experience in the preparation of schemes and estimates and the supervision of all types of installation work in industrial and commercial premises and public buildings.

Salary scale: £616 to £946 p.a. Grade "L.13," N.J.B. conditions.

Applications to Sub-Area Manager, No. 2 Sub-Area, The North Western Electricity Board, National Buildings, St. Mary's Parsonage, Manchester 3, by July 25, 1953.

APPOINTMENT OF GENERAL ASSISTANT DISTRICT ENGINEER (Assistant District Installation Inspection Engineer)
3a Oldham District.

Applicants should have had extensive experience in the inspection of electrical installations in domestic and commercial premises and in schools, public institutions, etc., and should be fully acquainted with the various regulations relating to electrical installations. Experience in electrical testing and metering will be considered an additional recommendation.

Salary scale: £534 to £555 p.a. Grade "G.12," N.J.B. conditions.

Applications to Sub-Area Manager, No. 3 Sub-Area, The North Western Electricity Board, Union Street, Oldham, by July 25, 1953. (E 387)

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the position of SENIOR ASSISTANT ENGINEER on the staff of the Generation Engineer (Operation) at Divisional Headquarters, Portsmouth.

Salary: N.J.B. "AX/CX1," £970-£1,103-£1,166.

The duties will include responsibility for the co-ordination of maintenance of generating plant throughout the Division and certain special responsibilities connected with the Factory Acts, Safety, Security and Fire Precautions.

Applicants should have had considerable experience of the operation, maintenance and administration of a large generating station and be conversant with the problems arising from the operation of small steam generating stations and diesel plant.

They should also have a working knowledge of the National Agreements governing the conditions of staff and manual workers, and should preferably be Corporate Members of a recognised professional institution, or hold equivalent qualifications.

Special forms of application can be obtained from the undersigned and should be returned to this office not later than Wednesday, July 29, 1953.

P. D. A. OLIVER,
Divisional Secretary.

British Electricity House,
111 High Street,
Portsmouth, Hants. (E 407)

BRITISH ELECTRICITY AUTHORITY

South Western Division

JUNIOR ENGINEER (Control) required at Hayle Generating Station.

Superannuation scheme. Salary, N.J.B. Class "F," Grade 15, commencing at £402.

Applicants should possess O.N.C. in electrical or mechanical engineering or equivalent. Previous generating station experience considered an advantage.

Applications, on Form A.E.6/ACT, obtainable from the Divisional Secretary, 28 Oakfield Road, Bristol 8, should be completed and returned by July 27, 1953. (E 396)

EASTERN ELECTRICITY BOARD

Suffolk Sub-Area

ENGINEERING DRAUGHTSMAN

APPLICATIONS are invited for the appointment of an Engineering Draughtsman at Suffolk Sub-Area Headquarters, Finborough Hall, Stowmarket.

Candidates should have a sound knowledge of applied mechanics, including the theory and design of structures and a good working knowledge of electrical engineering practice would be considered an advantage. The successful candidate will be required to assist in the design of poles and structures and in the preparation of specifications for overhead lines up to 33 kV.

The salary will be in accordance with Grade 6 of Schedule "D" of the National Joint Board Salary Agreement, commencing at £453 p.a. Both future salary and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications by letter, stating age, education, qualifications and experience, with details of present appointment and salary, should be submitted to the Manager, Suffolk Sub-Area, Eastern Electricity Board, Finborough Hall, Stowmarket, Suffolk, within 14 days of the appearance of this advertisement. (E 398)

SOUTH EASTERN ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEER
Eastbourne District.

SALARY in accordance with N.J.B. Schedule, Class "E," Grade 12, commencing at £462 p.a. Superannuable. Applicants should have had experience in the construction, operation and maintenance of underground and overhead single and three-phase systems up to 11 kV. and should hold the Higher National Certificate, or its equivalent, in electrical engineering.

Applications, giving two referees, must reach J. E. Winborne, Eastbourne Manager, SEEBoard, Electric House, Grove Road, Eastbourne, by July 20, 1953.

DEMONSTRATOR (FEMALE)
West Kent District

Salary £380 by £20 to £460 by £10 to £470 p.a. under N.J.C. Grade 1 plus London Weighting. Applicants should possess a recognised diploma or certificate in domestic science and the E.A.W. Certificate. The person appointed will be required to conduct lectures and demonstrations, advise consumers and generally assist in showrooms.

Applications, giving two referees, on forms from P. A. Watson, M.I.E.E., West Kent Manager, SEEBoard, 270 High Street, Orpington, Kent, by July 29, 1953.

A. L. BURNELL,
Secretary.

July 10, 1953. (E 402)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Salary, including London Allowance, and conditions of service in accordance with N.J.B. Agreement, Schedule "A." Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

JUNIOR ENGINEER (Control)
Bankside Generating Station and Brunswick Wharf Generating Station

Duties include assisting in main control room, with opportunity for gaining general knowledge of power station. Shift duties. Salary, Class "H," Grade 15, £457 p.a.

JUNIOR ENGINEER (Shift) (Control Room)
Barking "A" and "B" Generating Station

Sound engineering training necessary, with generating station experience. Salary, Class "M," Grade 17, £557 11s. p.a.

Application may be made on form obtainable from Divisional Secretary, B.E.A., London Division, Generation House, Great Portland Street, W.1, and to received within 14 days of this advertisement. (E 400)

MIDLANDS ELECTRICITY BOARD

DEMONSTRATOR (female) required for Worcester District. Applicants must have had a good education and should have a certificate of a recognised Domestic Training College and/or the E.A.W. certificate.

Duties involve lecture demonstrations in Service Centres and on consumers premises and advice to consumers on the selection and use of electrical apparatus. Salary £380/£470 per annum (N.J.C. Grade 1) Superannuable.

Applications in writing within 14 days, stating age, education, qualifications, training and experience to Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

A. STEPHENS,
Secretary.
(E 393)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT SECTION ENGINEER required in the Wrexham District of No. 4/5 Sub-Area. Salary N.J.B., "F.9" (£607 to £626 per annum).

Applicants should preferably have the technical qualifications to enable them to become chartered electrical engineers and have had experience in the h.v. and m.v. overhead and underground distribution work.

The appointment is superannuable and subject to medical examination.

Standard application forms obtainable from the Manager, No. 4/5 Sub-Area, Electricity House, Rhostyllen, nr. Wrexham.

Closing date July 27, 1953. (E 361)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ENGINEERING DRAUGHTSMAN (ARCHITECTURAL) required in the Engineering Department at the Headquarters of the Board, Electricity House, Love Lane, Liverpool 3. Salary £433 to £567 per annum (N.J.B. Schedule "D," Grade 6).

Applicants must have experience in building work as applied to industrial and commercial premises, and/or reinforced concrete structures and foundations and should at least have obtained the Ordinary National Certificate or equivalent.

The appointment is superannuable and subject to medical examination.

Applications should be made on forms obtainable from the Establishments Officer at the above address.

Closing date July 27, 1953. (E 375)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

STATION SHIFT CONTROL ENGINEER required at Nechells "A" Generating Station. N.J.B. service conditions; superannuable appointment; salary within Schedule "A," Grade "F.10," commencing at £577 per annum.

Higher National Certificate in electrical engineering or equivalent qualification required, together with sound technical training and practical experience in the control and operation of steam generating plant and main switchgear.

Forms of application available from Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, to be returned by August 1, 1953. (E 401)

SOUTH EAST SCOTLAND ELECTRICITY BOARD

Edinburgh Sub-Area

ASSISTANT CONSTRUCTION ENGINEER

APPLICATIONS are invited for the above appointment.

Applicants should have had a sound general education and should have obtained the Higher National Certificate in Electrical Engineering and have had experience in the laying and jointing of all classes of cable up to 33 kV and the installation, testing and commissioning of substation plant.

Salary N.J.B. Scale, Class H, Grade 10—£641/667 per annum. Superannuation Scheme.

Applications, stating age, education, qualifications and experience should be submitted to Mr. G. T. Allcock, Manager, Dewar Place, Edinburgh, 3, within 14 days from the appearance of this advertisement. (E 358)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

COMMERCIAL ASSISTANT required in the Wallasey District at a salary of £524 to £540 per annum (N.J.B. Class "E," Grade 11).

Applicants must have had sound technical training and should preferably be in possession of the Higher National Certificate in Electrical Engineering or an equivalent qualification.

Duties include estimating for contracting work and advising consumers on electricity supply matters and appliances.

The appointment is superannuable and subject to medical examination.

Applications, on a form obtainable from the Manager, No. 3 Sub-Area, Merseyside and North Wales Electricity Board, Electricity House, Newgate Street, Chester, must be returned not later than July 30, 1953. (E 390)

BRITISH ELECTRICITY AUTHORITY

North Western Division

Vacancy No. 156/53.

SHIFT CHARGE ENGINEER, Stuart Street Generating Station, Manchester. Salary £772 to £802 ("H.7").

Apply to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, before July 23. Quote vacancy number. (E 391)

CENTRAL ELECTRICITY BOARD

Federation of Malaya

MECHANICAL ENGINEER (M2C/30095/EE) and ELECTRICAL ENGINEER (GENERATION) (M2C/30087/EE) required by the Central Electricity Board, Federation of Malaya. Option of appointment either (a) on agreement for three years with prospect of permanency, or (b) on contract for three years with gratuity of £200 to £280 a year. Salary, etc., according to qualifications and experience in scale equivalent to £1,197 rising to £2,100 a year. Additional allowances between £210 and £630 a year are payable to married men according to salary and dependants. Free passages. Liberal leave on full salary. Opportunity of terminating appointment at the end of one year if so desired. Mechanical Engineer: Candidates must have had sound electrical and mechanical engineering training and experience in the operation and maintenance of diesel alternator generating plant of up to 1,000 kW units. Electrical Engineer (Generation): Candidates must have had sound training in mechanical engineering, with experience in the operation of medium sized electricity supply undertakings. They should possess a complete knowledge of the operation and maintenance of water tube boilers, steam turbines and high and low tension switchgear. Candidates for both appointments should preferably be Corporate Members or Graduates of the Institutions of Electrical or Mechanical Engineers or possess equivalent qualifications.

Write to the Crown Agents, 4 Millbank, London S.W.1, State age, name in block letters, full qualifications and experience, and quote reference number against the post for which application is made. (E 410)

INSTALLATION SUPERINTENDENT

REQUIRED by the ELECTRICITY BRANCH of the SIERRA LEONE GOVERNMENT, P.W.D., for one tour of 18 to 24 months with prospect of permanency. Commencing salary, etc., according to experience in scale £792 rising to £1,140 a year. Outfit allowance £60. Free passages. Liberal leave on full salary. Candidates should have served an apprenticeship in the consumer's section of an electricity undertaking and should possess an O.N.C. or H.N.C. in electrical engineering. Experience in the installation of power and lighting circuits to comply with I.E.E. regulations is essential. Some experience in testing of single-phase kWh meters is important.

Write to the Crown Agents, 4 Millbank, London S.W.1, state age, name in block letters, full qualifications and experience and quote M2C/28555/EE. (E 411)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 59/53

APPLICATIONS invited for superannuable N.J.B. appointment of ENGINEERING DRAUGHTSMAN (MECHANICAL) in the Generation (Construction) Department. Salary: "D6" (£433-£567 p.a.).

Knowledge of mechanical installations and plant layout required and preference given to candidates with H.N.C. or equivalent.

Application forms, obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-Fedwen Road, Gabalfa, Cardiff, should be returned by July 29, 1953. (E 408)

BRITISH ELECTRICITY AUTHORITY

WISH to appoint a PRINCIPAL ASSISTANT in the FINANCE BRANCH at their Headquarters in London. Applicants should preferably possess a recognised accountancy qualification or a degree in economics or commerce and should have had a wide experience of electricity supply finance and accounts. In particular the post calls for knowledge of budgetary control and ability to prepare concise and lucid reports on financial matters. Salary (N.J.C. Grade 8), £905 to £1,010 incl.—Letters of application stating age, present salary, qualifications and experience, to D. Moffat, Director of Establishments, Winsley Street, London W.1. Closing date July 28, 1953. Please quote AE/396. (E 385)

MIDLANDS ELECTRICITY BOARD

SURVEYOR/WAYLEAVE OFFICER required at Wellington District. Duties involve the survey and plotting of routes for proposed overhead lines, and the obtaining of wayleaves. Technical qualifications desirable. Salary, £460 to £520 per annum (N.J.C. Grade 2). Superannuable.—Apply, in writing, within fourteen days, stating age, experience, present position and salary to Mr. W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

A. STEPHENS,
Secretary.
(E 399)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SECOND ASSISTANT ENGINEER (PROTECTION) required at the No. 2 Sub-Area Headquarters, Electricity House, Sandiway, near Northwich, Cheshire. Salary £869 to £907 per annum (N.J.B. "K.7").

Applicants should have the technical qualifications to enable them to become chartered electrical engineers and preference will be given to candidates holding a university degree in electrical engineering.

The duties will include testing and commissioning of switchgear, transformers and associated equipment up to 33 kV and experience in the installation, commissioning and maintenance of protective gear will be an advantage.

The appointment is superannuable and subject to medical examination.

Standard application forms obtainable from the Manager, above address.

Closing date July 27, 1953. (E 376)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 55/53

APPLICATIONS invited for N.J.B. superannuable appointments of JUNIOR ENGINEERS at Carmarthen Bay Power Station, Burry Port. Salary "K.19/15" (£402 to £545).

H.N.C. and manufacturing works training essential. Required for training in modern power station operation and maintenance.

Application forms obtainable from the Secretary, South Wales Division, British Electricity Authority, Twyn-y-Fedwen Road, Gabalfa, Cardiff, should be returned by July 27, 1953. (E 368)

APPLICATIONS are invited for the position of WATER HEATING ENGINEER responsible for the design and technical supervision of electric water heaters and allied products. Wide experience in this field is essential but applications from senior draughtsmen and section leaders, to whom this appointment would offer scope for substantial advancement, would be welcome. Our own staff have been informed of this vacancy.—Please write, with full details, to Box No. 2765, Electrical Times. (E 286)

B.B.C. requires two DRAUGHTSMEN for Planning and Installation Dept. in Central London, to prepare and alter drawings of wiring and equipment installations. Some training engineering drawing and tracing, with elementary knowledge electrical installations and symbols required. Max. £9 p.w.—Applications to Engineering Establishment Officer, B.B.C., London W.1, within 7 days. (E 412)

BIRLEC, LTD., Tyburn Road, Erdington, Birmingham 24, invite applications for position of SALES CORRESPONDENT primarily for dealing with tenders for heat treatment furnaces. Education to degree standard preferred, but not essential. Good prospects for young energetic man.—Apply by letter giving details of experience to the Personnel Officer. (E 366)

BRITISH ELECTRICITY AUTHORITY, Merseyside and North Wales Division, require SENIOR DRAUGHTSMAN (Electrical) in the Power Station Construction Department, Headquarters, Woolton, Liverpool. Salary, £567 to £671 per annum. N.J.B. Schedule "D," Grade 5. Superannuable and subject to medical examination. Applicants should have a good general and technical education, preferably possess the Higher National Certificate in electrical engineering and have had some experience in a drawing office associated with the construction of modern power stations or an electrical plant manufacturing works. Some workshop experience would be an advantage. The successful applicant will be required to prepare drawings and diagrams associated with power station electrical plant and equipment and check drawings and diagrams submitted by contractors.—Application forms from the Divisional Secretary, Beaconsfield Road, Woolton, Liverpool. Closing date, July 27, 1953. (E 405)

CABLE GANGER required for the Middle East, experienced in the handling of labour, drawing in of paper insulated armoured cables, etc., and capable of handling heavy lifts.—Apply, stating age and experience, forward copies of testimonials or names to whom we may apply, to Box No. 2795, Electrical Times. (E 354)

DRAUGHTSMEN required for low-tension small switch and fuse gear and electrical distribution equipment. —Write, giving age, details of experience and salary expected to the Personnel Officer, W. T. Henley's Telegraph Works Co. Ltd., Gravesend, Kent. (E 273)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

CHIEF ENGINEER

APPLICATIONS are invited for the appointment of Chief Engineer for a works manufacturing low tension switchgear and allied electrical installation products.

Applicants should be between the age of 30 and 45, preferably University Graduates of Ph.D. standing, and must have previous technical design and manufacturing experience in this field.

Reply: SECRETARY,
SIMPLEX ELECTRIC CO., LTD.,
Broadwell, Oldbury, Birmingham
(E 383p)

ELECTRICAL ASSISTANT required for editorial department in London. Preference given to qualified engineer. Previous editorial experience unnecessary, but lively mentality essential. Superannuable.—Write, giving full particulars and salary required, Box No. 2791, Electrical Times. (E 352)

ELECTRICAL contractor (London) has vacancy for ESTIMATOR used to large contracts, capable of handling them from inquiry to completion. Exceptional opportunity for experienced man able to accept responsibility.—Applications will be treated confidentially. State age, salary, with concise particulars of experience, Box No. 2789, Electrical Times. (E 351)

ELECTRICAL ENGINEER experienced in power station installation and commissioning, prepared to work on own initiative. A.M.I.E.E. or equivalent qualification. Pension scheme.—Write, Box No. 658, c/o Walter Judd, Ltd., 47 Gresham Street, London, E.C.2. (E 307)

ELECTRICAL LABORATORY ASSISTANT wanted for very high voltage paper-insulated cables. Permanent position but immediate duties would be on an important new development. Degree or H.N.C. standard and previous experience in paper cable work desirable.—Apply, giving full details of experience, etc., to Box No. 2785, Electrical Times. (E 326)

ELECTRICAL layout and cabling DRAUGHTSMAN urgently required, preferably H.N.C. or O.N.C. or practical experience, for modern power station h.t. and e.h.t. cabling, switchgear, protection systems. Good salary. London office, 5-day week; free lunches. 1953 holiday can be arranged. Good opportunities for experience. Pension fund. Quote Ref. E.L.D. and state age, education, training, salary required and when free. —Write, Box 675, c/o Walter Judd, Ltd., 47 Gresham Street, E.C.2. (E 373)

ELECTRICAL PROTECTION AND INSTRUMENT ENGINEER required for Middle East by large oil company. Aged under 30, full (instrument) apprenticeship, experienced in repair and testing of all types of electric meters, protective relays, voltage regulators and familiar with primary and secondary injection testing. Pensionable emoluments over £1,000 p.a. plus local allowance. Paid home leave after two years. Married man must be prepared for initial separation.—Write, quoting No. 339, to Box No. 6895, c/o Charles Barker and Sons, Ltd., 31 Budge Row, London E.C.4. (E 377)

ELECTRICAL TEST ENGINEER required. Experienced motors, wiring, circuits, installation and testing armaments, fire direction control or similar units. Good technical and theoretical background. Old-established large organisation Medway area.—Write full details to Box E.T. 516, c/o 191 Gresham House, E.C.2. (E 403)

ENGINEERS, electrical, electro-mechanical, mechanical and metallurgical, required for research, development and test work in laboratory dealing with aeronautical and guided weapons problems.—Apply to Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge, Surrey. (E 367)

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

ALKALINE BATTERIES LTD.,
of Redditch

are the makers of the well-known NIFE nickel cadmium alkaline accumulators, miners' lamps, portable lighting and all kinds of emergency lighting and standby power systems, products which have a wide and growing usage throughout industry, and particularly for export.

THE COMPANY HAS VACANCIES
in its sales engineering departments for

QUALIFIED ELECTRICAL ENGINEERS

for post graduate training, and applications are invited from men who either have a Degree in Electrical Engineering, or are nearing the end of their Degree course, and have completed National Service.

Applicants must be prepared to reside in any part of the country, or abroad, and must have a keen interest in the sales development side of an engineering product.

IN ADDITION

to the vacancies for post graduate training, there are a limited number of vacancies for

QUALIFIED ELECTRICAL ENGINEERS

not over 30 years of age, who already have outside sales experience.

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Applications, giving full educational details and experience, if any, should be addressed:—

Commercial Manager,
ALKALINE BATTERIES LTD.,
Union Street, Redditch, Worcs. (E 409p)

FERRANTI LTD. wish to make new appointments in their power transformer design office, and invite applications from suitable candidates for:—
(a) SENIOR DESIGN ENGINEERS.
(b) JUNIOR DESIGN ENGINEERS.
Candidates for the senior appointment should have had previous electrical design experience in power engineering preferably, but not necessarily, on transformers. A university degree is desirable, but other alternative qualifications will be considered. For the junior appointments applications are invited from young graduates or holders of the Higher National Certificate with an interest, and preferably some experience, in design of transformers or other electrical plant.
The appointments are to the permanent staff of an expanding design group and carry attractive salaries with excellent prospects of advancement. The positions are covered by the firm's staff pension scheme.
Forms of application from Mr. R. J. Hebbert, Staff Manager, Ferranti Ltd., Hollinwood, Lancs. Please quote Ref. WLE. (E 275)

JOINTERS required for work on aerodromes. Must be capable of jointing up to 11 kV.—Apply, Drake and Gorham (Contractors), Ltd., Pearl Assurance House, Plymouth, Devon. (E 363)

METERS, LTD. require a GENERAL SALES MANAGER. One who has connections with the gas industry preferred, but not essential. Prospects of early directorship for suitable applicant.—Replies, which will be treated in strict confidence, stating age, experience and salary expected, without which no application will be considered, should be addressed to the Chairman, Meters, Ltd., 51 King Street, Manchester 2, not later than July 31, 1953. (E 372)

PIRELLI-GENERAL CABLE WORKS LTD. invite applications for Steel Tower Transmission Line ENGINEER/SURVEYOR.—Write, giving full particulars of experience and salary expected, to Overhead Lines Department, Eastleigh, Hants. (E 269)

PLUMBER JOINTER for Middle East, experienced in jointing paper cables, lead covered and armoured up to 11 kV.—Apply, stating age and experience, forward copies of testimonials, or state names to whom we may apply, to Box No. 2797, Electrical Times. (E 355)

PUBLICITY ENGINEER wanted by makers of power transformers and power capacitors. Bonus and pension schemes in operation. Salary according to qualifications.—Apply: Bryce Electric Construction Co., Ltd., Kelvin Works, Hackbridge, Wallington, Surrey. (E 364)

RADAR TEST ENGINEER fully experienced required. Full responsibility adjustment, testing and installation complete short range marine radar sets. Old-established large organisation Medway area.—Write full details and salary to Box E.T.517, c/o 191 Gresham House, E.C.2. (E 404)

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Candidates must be under 35 on January 1, 1953, with extension for regular service in H.M. Forces and up to two years for permanent civil service. For the Post Office they must be at least 21, for the Ministry of Supply and Ministry of Civil Aviation at least 23, and for all other Departments at least 25 on that date.
Generally a candidate must possess a university degree in engineering or be a corporate member of one of the professional institutions—Mechanical Engineers, Electrical Engineers, or Civil Engineers—or have passes in, or exemption from, Sections "A" and "B" of the corresponding associate membership examinations. Exceptionally candidates of high professional attainment, but without the specified qualifications, may be admitted. For some posts Associate Fellowship of the Royal Aeronautical Society or an honours degree in physics will be accepted.
Inclusive salary scale (men in London), £628 (at age 25) to £970. Starting salary according to age up to £875 at 34. Candidates entering below age 25 will start at salaries varying from £429 at age 21 to £549 at age 24. Prospects of promotion. Salaries of next higher grades are £970 to £1,280 and £1,331 to £1,536. Somewhat lower for women and in the provinces.
Further particulars and application forms from Civil Service Commission, Scientific Branch, Trinidad House, Old Burlington Street, London W.1, quoting No. S85/53. (E 382)

SALES ENGINEER, with electrical and mechanical experience, required by well-known engineering firm, Newcastle-on-Tyne.—Box No. 2769, Electrical Times. (E 292)

SHIFT CHARGE ENGINEER for electricity supply undertaking in Bagdad. Applications are invited from suitably qualified Engineers, preferably between 25 and 35 years of age, who have had experience in the operation of a power station of at least 15,000 kW, with medium pressure boilers. Salary £1,000 to £1,300 per annum, plus high cost of living allowance. Free house with heavy furniture will be supplied or a monthly house allowance of £12 in lieu. Three-year contract, renewable, with first-class passage each way for successful applicant and family (if married). Three months' leave on full pay in U.K. on completion of 24 consecutive months in Iraq, first-class leave passages being paid.—Box No. 2807, Electrical Times. (E 413)

TECHNICAL SALES AND CONTRACT ENGINEER required for the preparation of estimates and tenders and for technical and commercial correspondence relating to motor control and industrial switchgear of up to 11 kV. H.N.C. or equivalent and experience in a similar position essential.—Apply by letter, giving age, details of experience, etc., to Personnel Dept., George Ellison, Ltd., Perry Barr, Birmingham 22B. (E 393)

THE GENERAL ELECTRIC CO., Ltd., has vacancies at the Head office of their Sales Organisation for young men in the age group 23-28 years who possess an Ordinary National Certificate and who are interested in working in one of our Sales Offices. Applicants should have had a good general education and preferably some previous experience.—Apply in writing, quoting reference "I.H.," to the Staff Manager, Magnet House, Kingsway, W.C.2. (E 406)

YOUNG ELECTRICAL ENGINEER to H.N.C. standards, wanted for manufacturers of electro-mechanical apparatus in London.—Reply, stating age, experience and salary required, to Box No. 2793, Electrical Times. (E 353)

YOUNG MAN required for Sales Office, Showroom, and to be general assistant to Sales Manager of manufacturers of electric lighting fittings.—Box No. 2803, Electrical Times. (E 379)

20TH CENTURY-FOX FILM CO., LTD. requires COMPETENT ENGINEER with basic training in motion picture engineering, optics, colour, audio and film handling.—Apply, 31 Soho Square, London, W.1. (E 362)

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75 kW CROMPTON, 110 V d.c., 525 r.p.m., 662 amps. Shunt interpole wound.

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INDEX TO ADVERTISERS

Aberdare Cables, Ltd. 74
Aidas Electric, Ltd. 17
Arora Co.... 4
Arrow Electric Switches, Ltd. ... 5
Ash & Lacy, Ltd.... 70
Automatic Telephone & Electric Co., Ltd. 67

B.B. Chemical Co., Ltd.... ... 68
Benjamin Electric, Ltd. 2
Booth, James, & Co., Ltd. ... 34
Bray, George, & Co., Ltd. ... 18
British Electricity Authority ... 12
British Insulated Callender's Cables, Ltd. 15
British Thomson-Houston Co., Ltd. 1
British Physical Laboratories, Ltd. 62
Brook Motors, Ltd. 61
Brush Electrical Engineering Co., Ltd. 51
Bullers, Ltd. 6
Burco, Ltd. 30

Cable Makers' Association ... 37
Cayson Electrics, Ltd. 18
Channel Conduits, Ltd.... ... 33
Clang, Ltd. 60
Contactor Switchgear, Ltd. ... 20
Cooper & Co. (Birmingham), Ltd, ... 8
Copper Development Association 57
Cressall Manufacturing Co., Ltd. 4
Critchley Bros., Ltd. 70
Crockatt, W., & Sons, Ltd. ... 8

Daly (Condensers), Ltd. ... 58
Drubel Distributors, Ltd. ... 54

Eagle Engineering Co., Ltd. ... 60
East London Mica Works ... 58
Edison Swan Electric Co., Ltd.... 32
Eeto Insulations 68
Electrical Times, Ltd. 70
Elkay Electrical Manufacturing Co., Ltd. 62
Ellison, George, Ltd. 38
English Electric Co., Ltd. ... 31
Enthoven Solders, Ltd. 72
Evershed & Vignoles, Ltd. ... 16

Ferguson Pailin, Ltd. 69
Ferranti, Ltd. 28

General Electric Co., Ltd. 40, 63
Grelco, Ltd. 70

Hedin, Ltd. 62
Henley's W.T. Telegraph Works Co., Ltd. 41, 56
Higgs Motors, Ltd. 10

Johnson & Phillips, Ltd.... 35, 59

Kleenoff Co. 22

Low, Duncan, Ltd. 54
Lyons, Claude, Ltd. 22

Martindale Electric Co., Ltd. ... 56
Mather & Platt, Ltd. 64
Metropolitan Plastics, Ltd. ... 25
Metropolitan-Vickers Electrical Co., Ltd. 21
Metway Electrical Industries, Ltd. 23
Midland Electric Manufacturing Co., Ltd. 11

Nife Batteries, Ltd. 3

Parmiter Hope & Sugden, Ltd.... 73
Pirelli-General Cable Works, Ltd. 24
Pitman, Sir Isaac, & Sons, Ltd. ... 52

Quadrant Meter Co., Ltd. ... 62

Radiovisor Parent, Ltd.... ... 52
Rainsford & Lynes, Ltd.... ... 66
Resistances, Ltd. 18
Reyrolle, A., & Co., Ltd. ... 36
Rowlands Electrical Accessories, Ltd. 19

Sanders, William, & Co. (Wednesbury), Ltd. 14
Sangamo Weston, Ltd. 42
Sax, Julius, & Co., Ltd. 52
Serck Tubes, Ltd. 14
Siemens Electric Lamps & Supplies, Ltd. 53
Sifam Electrical Instrument Co., Ltd. 14
Simon-Carves, Ltd. 9
Smart & Brown (Engineers), Ltd. 64
Smiths Industrial Instruments, Ltd. 68
Standard Telephones & Cables, Ltd. 65
Synthetic Carbon & Engineering Co., Ltd. 66

Telegraph Construction & Maintenance Co., Ltd. 27
Thew, Edward H., Ltd. 66
T.M.C.-Harwell (Sales), Ltd. ... 29
Tucker Geo. Eyelet, Co., Ltd. ... 22
Tudor Accumulator Co., Ltd. ... 55
Turner Brothers Asbestos Co., Ltd. 7

Volex Electrical Products, Ltd. 26

Washers, Ltd. 66
Weir Electrical Instrument Co., Ltd. 8
Westinghouse Brake & Signal Co., Ltd. 71
Whiteley, B. S. & W., Ltd. ... 13
Wootton & Co., Ltd. 4

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Head of Department: W. H. DATE, B.Sc.(Eng.), M.I.E.E.

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J. C. JONES,
Director of Education.
(E 371)

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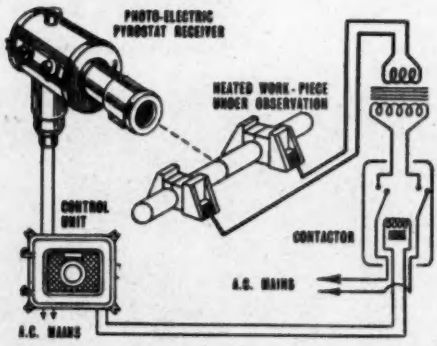

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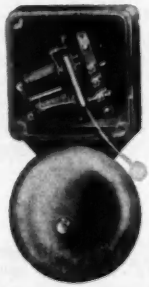

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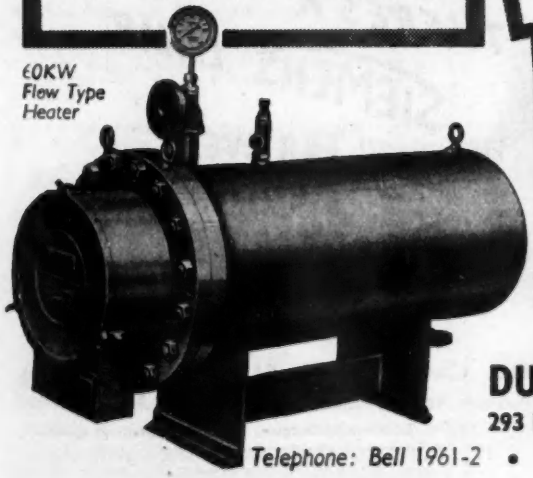

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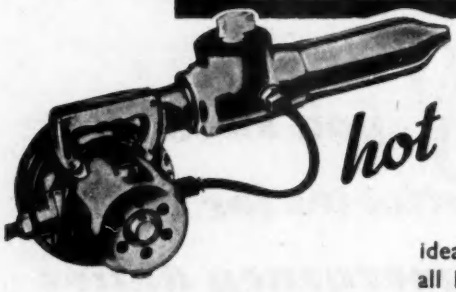

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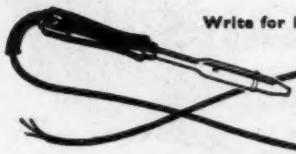

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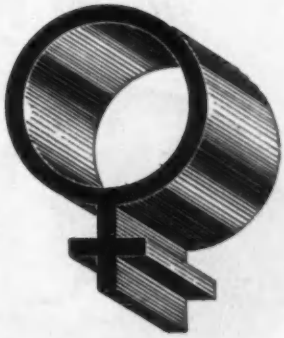

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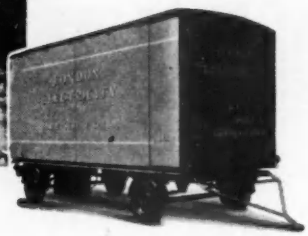

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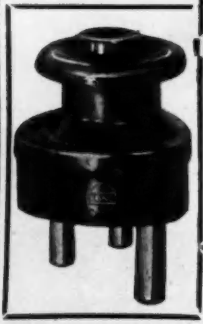

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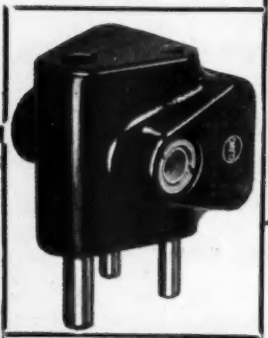

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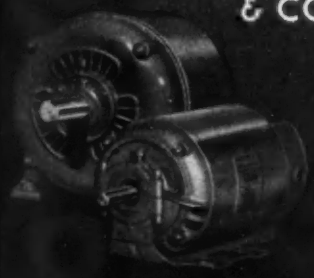

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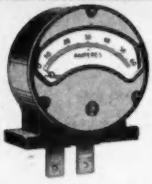

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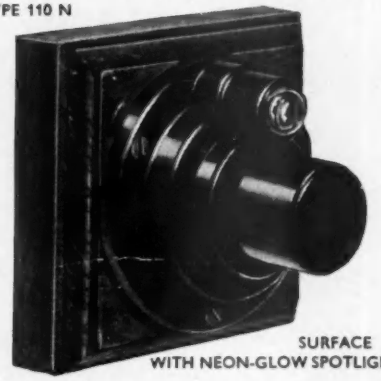

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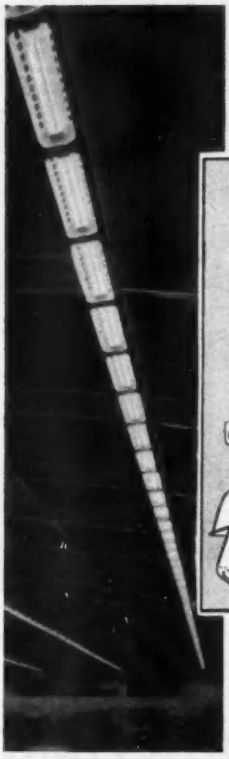

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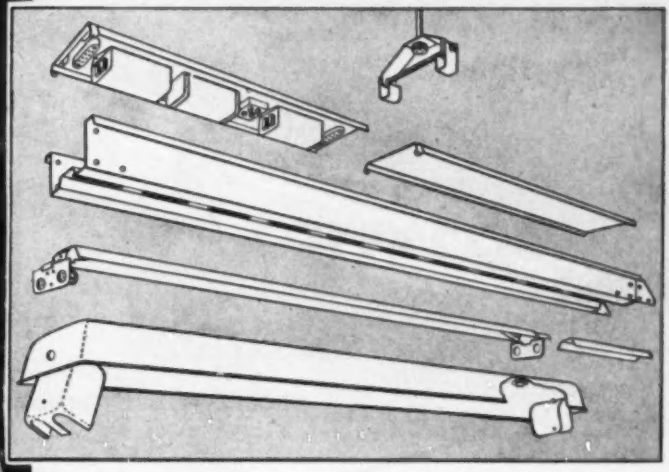

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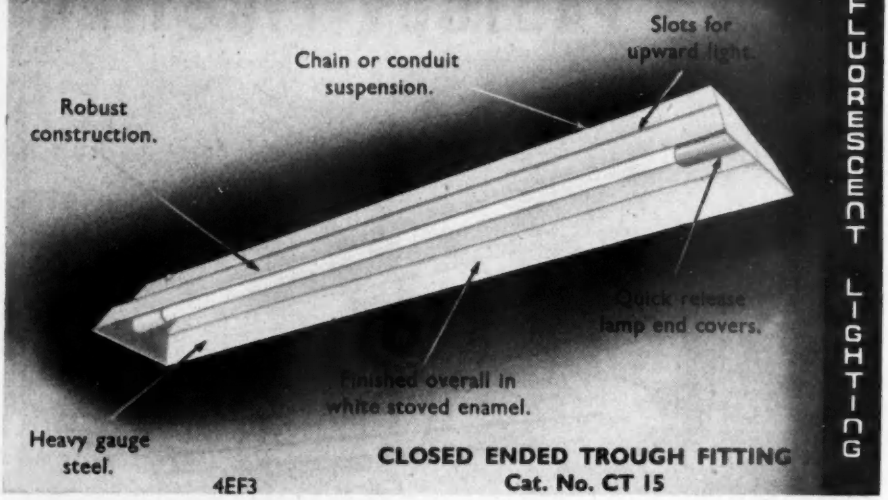
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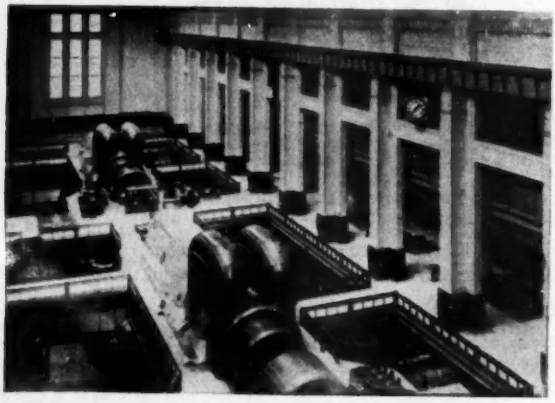

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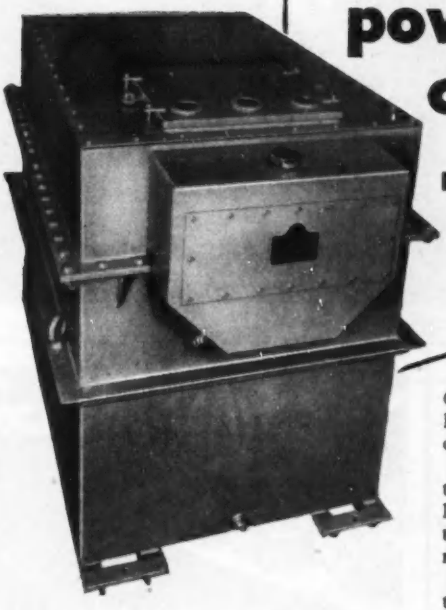

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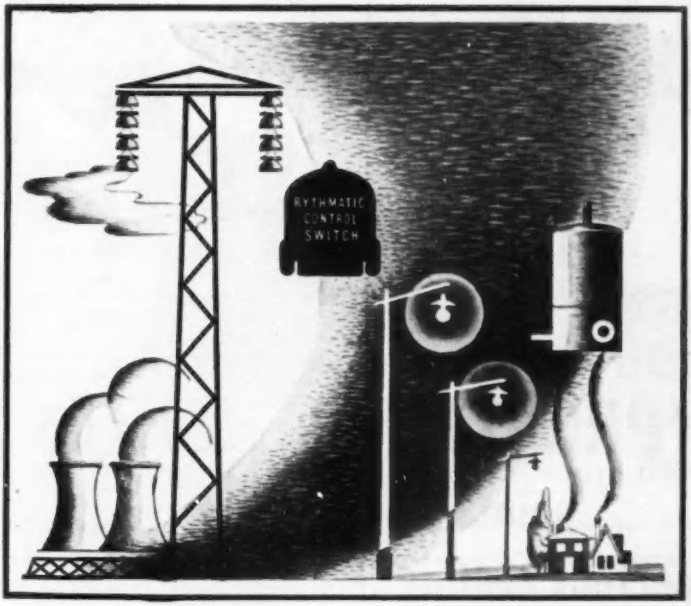

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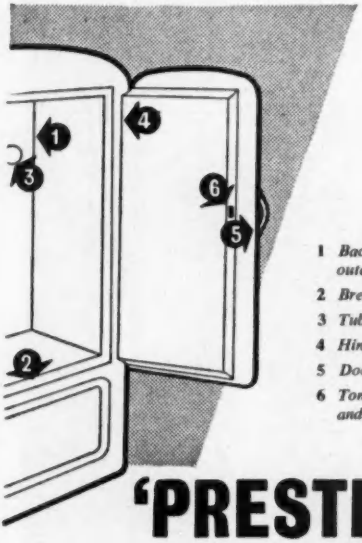

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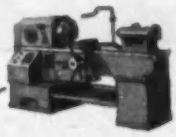

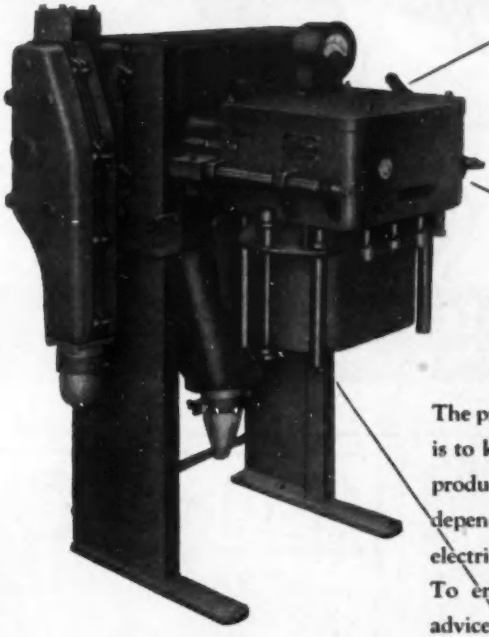

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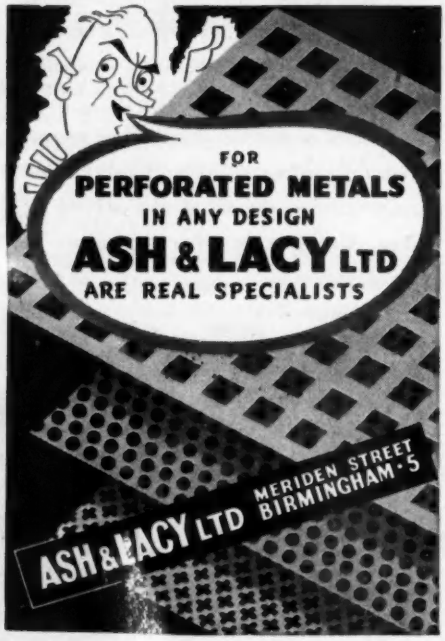

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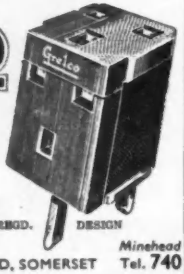

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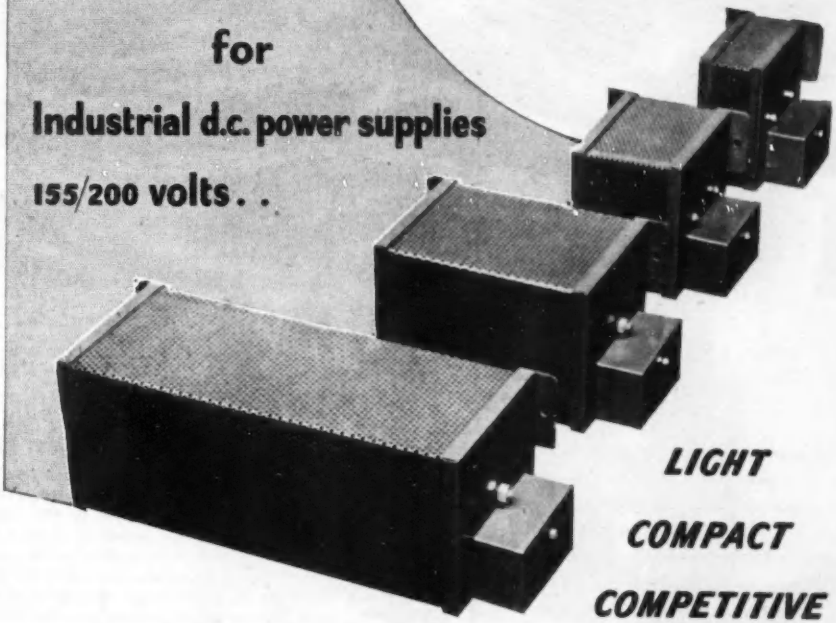

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